SCIENTIFIC AMERICAN

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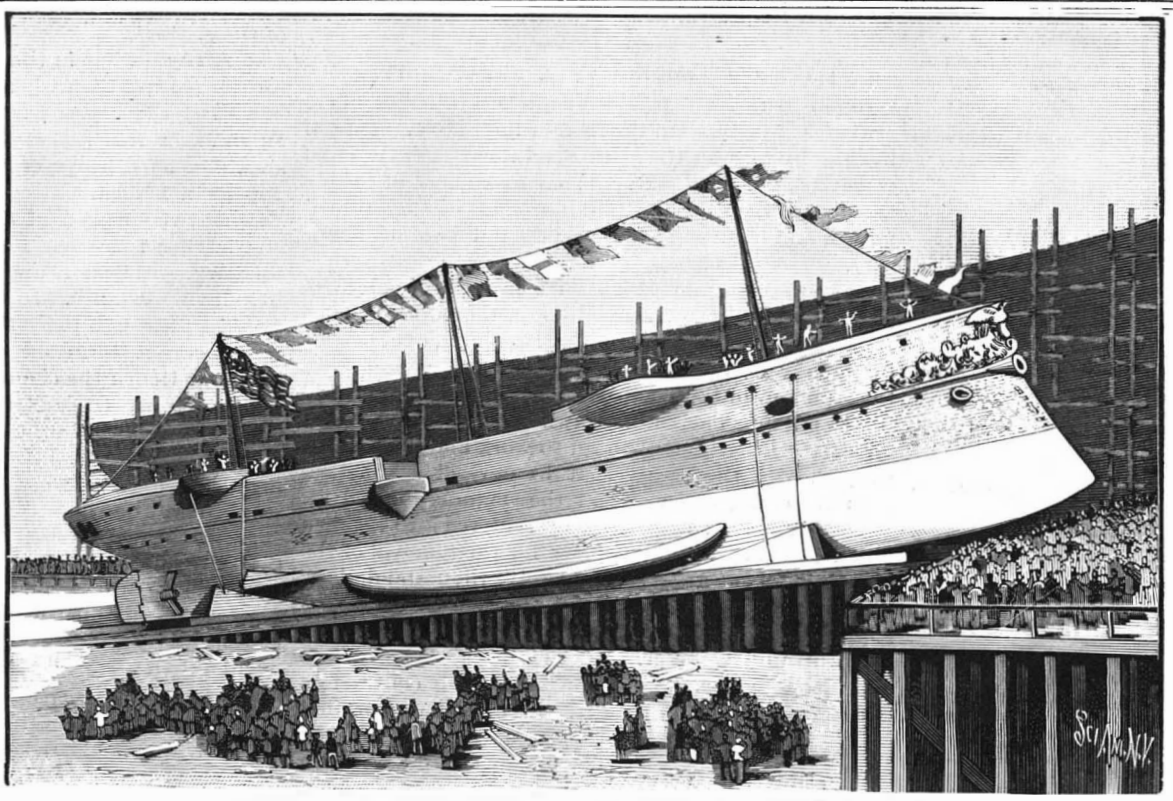
LAUNCH OF THE YORKTOWN AND VESUVIUS.

On Saturday, April 28, two of the new vessels for the United States navy were successfully launched at Philadelphia before a gathering of many hundred people. In addition to the ordinary crowds that gather on these occasions, the Secretary of the Navy with a number of special guests from Washington were present. The scene of the launching was the ship yard of Wm. Cramp & Sons, on the banks of the Delaware River.

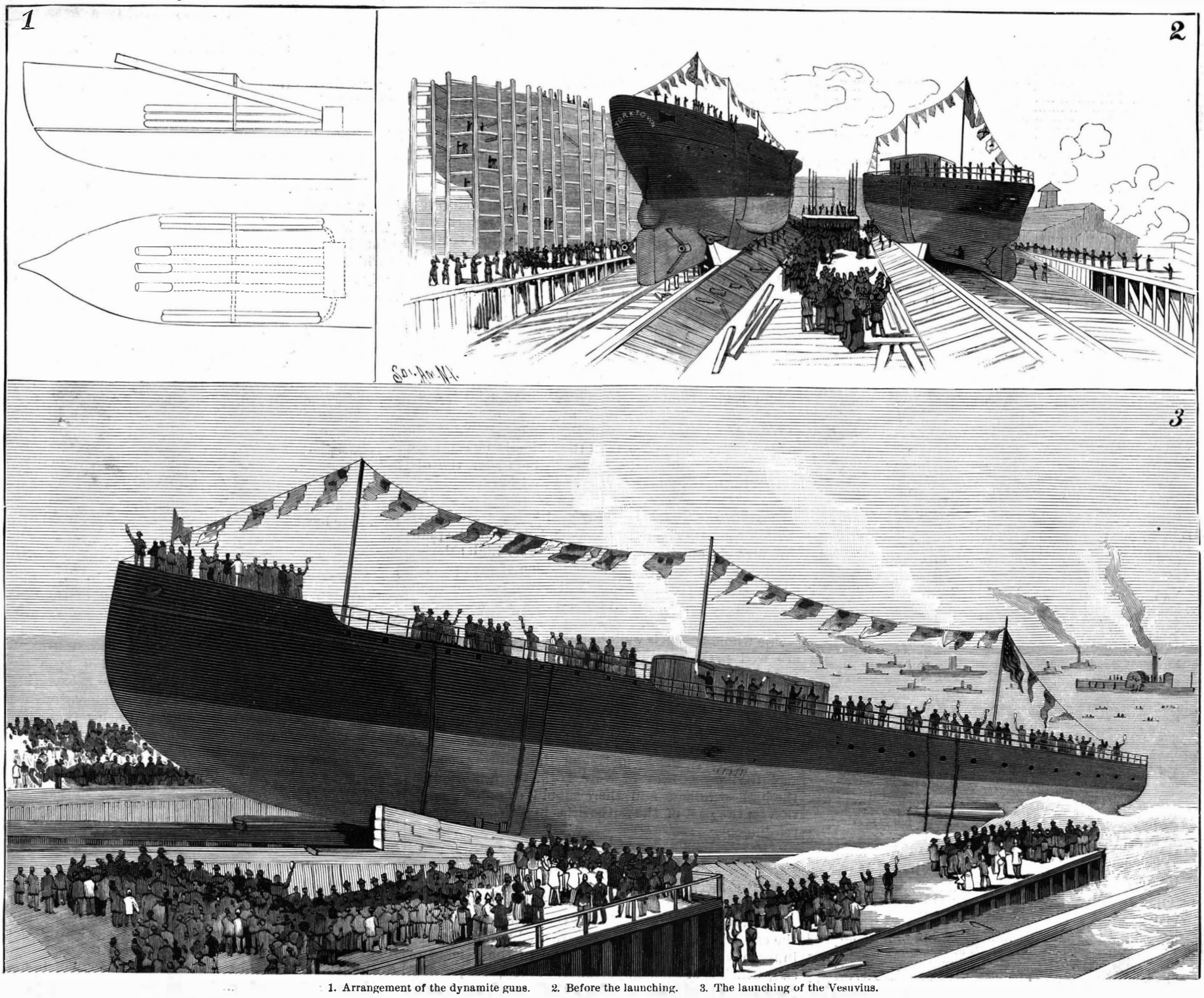
A special train had brought the Secretary of the Navy, with a large party of congressmen and their friends and families, from Washington. They were taken on board the steamboat Columbia, whence many of them viewed the launch. The crowd that filled the neighboring wharves and every point of view was estimated at 5,000. The scaffolding surrounding the unfinished hull of the cruiser Baltimore, the Yorktown's neighbor, was covered with people. A large party of visitors were present on each ship, and went down the ways with them.



THE U. S. GUNBOAT YORKTOWN ON THE WAYS.

The hour of the launch had been set for 3 o'clock. Ten minutes before the hour, the wedges on the ways of the Yorktown were driven in, and as the weight was taken up by them and the keel blocks were freed, the latter were knocked away. A few minutes after three the upper ways were sawed, and the Yorktown slowly and gracefully ran down into the water and at once floated up stream with the tide. Meanwhile the same had been done for her companion, and a few

(*Continued on page* 293.)



1. Arrangement of the dynamite guns. 2. Before the launching. 3. The launching of the Vesuvius.

THE LAUNCHING OF THE U. S. GUNBOAT YORKTOWN AND THE DYNAMITE GUNBOAT VESUVIUS.

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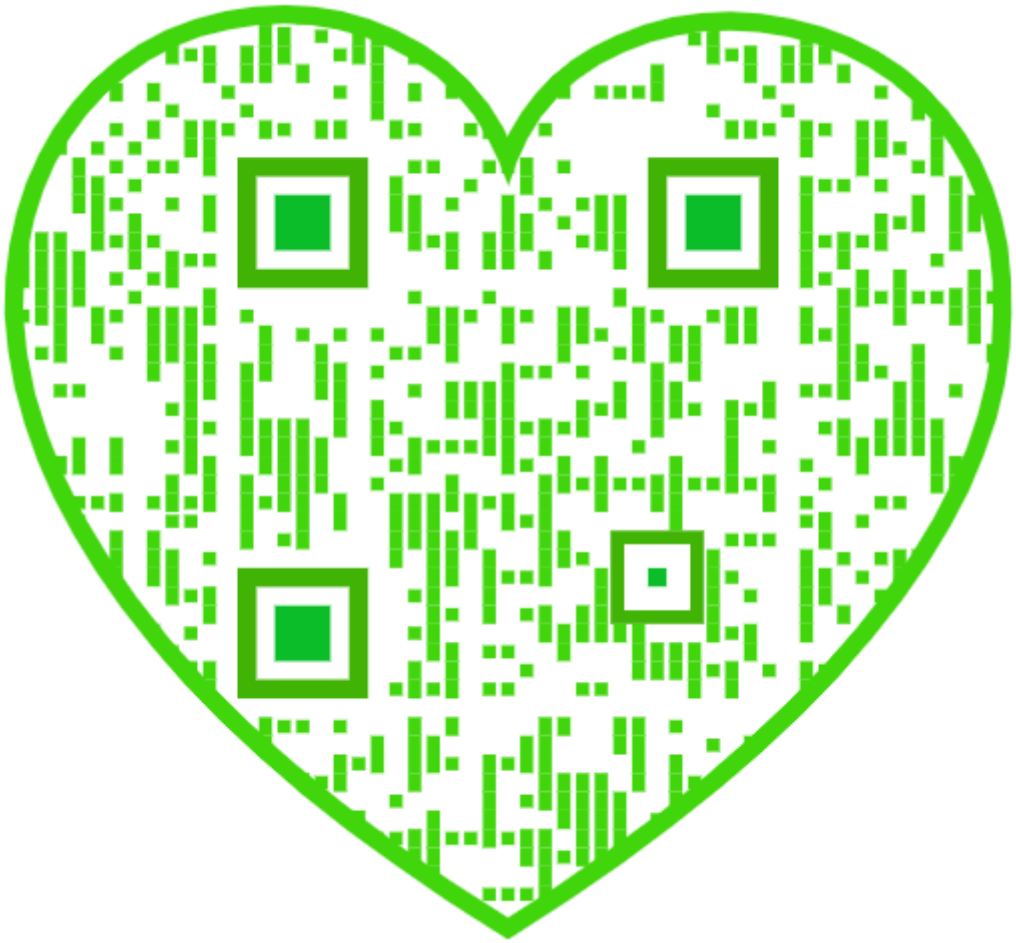

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NEW YORK, SATURDAY, MAY 12, 1888.

Contents.

(Illustrated articles are marked with an asterisk.)

Artesian well, new, at Paris..... 294
Bag holder, improved*..... 290
Books and publications, new..... 298
Business and personal..... 298
Butterflies for the cabinet, preparation of*..... 297
Carbon dioxide, absorption of*.. 295
Celestial world, the..... 289
Chemical misnomers..... 295
Chief Justice Fuller, appointment of..... 288
Cingalese rock fortress..... 293
Coast of England, changes of level in..... 293
Collisions at sea..... 288
Correspondence..... 293
Gate, improved*..... 292
Gate, lifting and swinging*..... 291
Hero of the throttle..... 292
Hotel, moving a great, successful..... 288
Insect pests..... 289
Inventions, agricultural..... 298
Inventions, engineering..... 298
Inventions, index of..... 299
Inventions, miscellaneous..... 298
Jar, fruit, improved*..... 291
Lamps, improved, needed..... 293
Leaf prints, how to make..... 292
Mail bags, improved, still needed 290
Meteor, a..... 293
Meteor, remarkable..... 289
Mica, uses of..... 294
Military notes..... 289
Natural history notes..... 296
Notes and queries..... 299
Nut lock improved*..... 290
Observatory, Smith, Geneva, N. Y..... 288
Ores, apparatus for examining*.. 291
Paddle belt for propellers, improved*..... 291
Patent law for Switzerland..... 288
Photo. plates, improved..... 290
Plate straightening machine, improved*..... 294
Printing press, self-inking improved*..... 292
Propellers, best material for..... 296
Public works, proposed reorganization of..... 288
Queer name for an American war vessel..... 290
Rotary engine, improved*..... 290
Ship, $4,000,000..... 291
Silver plating solution..... 292
Soapstone paint for iron..... 292
Steam carriage, Virot's*..... 295
Steam engine, sectional model of* 297
Steel, Henderson..... 289
Stock tether, improved*..... 290
Suspender buckle, improved*.... 290
Ten cows hanged..... 288
Tie, chair, and fish plate, combined*..... 291
Trainmen, safety of, appliances for..... 292
Twilight, colors of..... 295
Vesuvius, launch of*..... 287
Water, decomposition of*..... 295
Water power for milling..... 294
Yorktown, launch of*..... 287

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 645.

For the Week Ending May 12, 1888.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ARCHÆOLOGY.—The Great American Pyramid and Ruined Cities of Arizona and New Mexico.—Description of the pyramids of Cholula and Tula.—A rich field for research.—Marvelous discoveries in Arizona and New Mexico..... 10307

II. BIOGRAPHICAL.—C. R. Agnew, M.D.—His professional work... 10306
Emin Bey (Dr. Schnitzler), Governor of the Provinces of the Equator.—With portrait..... 10307

III. CHEMISTRY.—The Ptomaines.—By Prof. A. P. LUFF.—A paper read before the Chemists' Assistants' Association, treating of the nature of ptomaines, their chemical constitution, their properties, and the part which they are to play in the drama of life in the future..... 10309
The Chemical Examination of Resins..... 10310

IV. ELECTRICITY AND THERMOTICS.—E. Raub's thermo-electric Battery.—By G. BETZ.—A new device from which all the shortcomings of the old thermo batteries have been removed.—1 illustration..... 10303
A New Pattern of Reflecting Galvanometer with Lamp and Scale.—By G. L. ADDENBROOKE.—Full description of the invention, with 3 illustrations..... 10304
A Luminous Heat below the Red..... 10303

V. ENGINEERING.—Highly Volatile Liquids for Propulsion.—By A. F. YARROW.—A paper read before the Institution of Naval Architects..... 10296
An Improved Form of Gas Apparatus.—By J. T. WILLARD.—With description and illustration..... 10297
A New Method of Rolling Tubes.—The principles of the Reinhard Mannesmann method.—Several figures..... 10297
Boiler Explosion at Friedenshutte.—Destruction of 22 boilers at one moment.—Description of the plant.—Probable cause of the explosion.—Several figures..... 10298
Machine for Manufacturing Beton and Mortars.—Inconveniences of the old machines and advantages of the new one.—Description of the latter.—3 illustrations..... 10300
The Lookout Mountain Inclined Railway.—An abstract of the paper read by Mr. W. H. ADAMS before the American Society of Mining Engineers.—6 illustrations..... 10301

VI. HYGIENE—THERAPEUTICS.—Wasted Sunbeams—Unused House Tops.—By GOUVERNEUR M. SMITH, M.D.—The dwellings of the ancients compared with modern habitations.—Unwholesome arrangements of upper stories.—The roof as a pleasant resort.—Needs of inhabitants of tenement houses..... 10306
Remedy for Ivy Poisoning..... 10306

VII. MINING.—Imperial Quicksilver Mines at Idria, Austria.—An interesting account of the government works, with full page of illustrations..... 10304

VIII. MISCELLANEOUS.—Latent Cold.—Most effective methods of thawing snow.—Ineffectual use of fires..... 10296
Tuxpan—A Rising Port of Mexico.—2 illustrations..... 10308
Economy of Nature.—Economy as seen in the structure of the bones of animals, in plants, etc..... 10308
Preservation of Blood in its Fluid State..... 10310

IX. PHOTOGRAPHY.—Recent Improvement in the Platino-Type Process.—By W. WILLIS.—A paper read before the Conference of the Camera Club, and treating of the principles on which the process is based, methods used heretofore, and printing and developing..... 10299

X. TECHNOLOGY.—Manufacture of Dolls at Paris.—Description of the process.—5 illustrations..... 10295
The Importance of Cleaning Wheat.—By R. JAMES ABERNATHEY.—A practical paper on the subject.—Best machines for the purpose..... 10295
The Pneumatic Dynamite Gun.—The pneumatic tube.—Experiments with the Zalinsky gun.—Advantages and disadvantages of the use of the gun.—The fuse and projectile used.—6 figures..... 10302

A PATENT LAW FOR SWITZERLAND.

Switzerland and Holland are almost the only nations in Europe that have no patent laws. In Switzerland the Federal Assembly passed resolutions in 1886 in favor of submitting to the popular vote the question of the desirability of establishing patent laws, and the voice of the people given in 1887 was four to one in favor of a patent enactment. The Federal Council has accordingly formulated a patent bill which will soon be presented to the Federal Assembly and it is expected will be passed. The proposed law contains features resembling the French patent law, with certain "modern improvements." We shall give the details when the bill passes.

SUCCESSFUL MOVING OF A GREAT HOTEL.

In our issue for April 14 we gave a number of engravings illustrating the somewhat novel mode of moving by railway the great Brighton Beach Hotel, at Coney Island, N. Y. By the encroachment of the sea the foundations of the building had become undermined, and its prompt removal inland became necessary.

The Brooklyn and Brighton Beach Railroad Company, the owners of the building, thereupon applied to Messrs. B. C. Miller & Son, of Brooklyn, experienced house movers, to undertake the job. Mr. Langford, the secretary of the company, asked if the house could not be put on wheels and drawn back by locomotives. Mr. B C. Miller thereupon set to work and studied the subject, with the result that he devised a practical plan for doing the work in the manner hinted at. December 5, 1887, a contract was entered into between Miller & Son and the company for the removal of the building, for the gross sum of twelve thousand dollars, all the cars, tracks, locomotives, etc., required to be supplied by the company, the work being done exclusively by Messrs. Miller. It is gratifying to be able to say that the work was conducted by the contractors in the most successful manner. No obstruction or difficulty in carrying out the work, as planned by Mr. Miller, was experienced. The great building has been moved back from the seashore a distance of 595 feet, and now stands on its new site. It is being rapidly finished for summer business. The estimated weight of the building, cars, and timbers was 6,000 tons, to carry which 112 strong railway cars were employed.

PROPOSED REORGANIZATION OF PUBLIC WORKS.

The executive board of the council of engineering societies on national public works have recently been engaged in compiling a short treatise on a proposed reorganization of national public works. The movement in the direction of such reorganization was started at Cleveland, Ohio, in 1885. At a meeting held there, beginning December 3, by duly accredited delegates from ten civil engineering societies, a report was adopted which stated the desirability of a more extensive employment of civilian talent in government engineering works. In the report, Congress is asked to establish a civil bureau of public works. A few months later, the council under whose auspices the present pamphlet is being compiled and edited was formed. Taking up the one subject of the river and harbor improvements, for the present, the organization of a well paid civil staff is suggested. This staff, it is stated, should range from chief engineer, with a salary of $10,000, through such grades as 4 associate chiefs at $7,500, 9 department engineers at $6,000, etc., down to 250 cadet engineers at $1,200. All these should be commissioned by the President, and should be under the direction of the Secretary of War. Provision is made for appointments of army engineers to positions on the civil staff, and about half the positions it is proposed shall at the start be thus filled. The object of the plan is to provide a more efficient force. The high salaries are designed to secure good men—men of such professional standing that they would refuse to occupy positions in the present military service, on account of the low compensation.

The whole system is well thought out, and its features are well presented in the pamphlet before us. The matter has been brought to the President's notice by a memorial, and House of Representatives bill No. 4,923, by Messrs. Cullom and Breckenridge, has brought it before Congress. Both of these documents are given in the pamphlet. There is a great deal to be commended in the scheme. In the matter of the improvement of such harbors as that of New York, there is room for the highest talent, and there should exist no hesitation on the part of the authorities in providing for its retainment.

Collisions at Sea.

At the recent meeting of the Institution of Naval Architects a paper was read by Mr. J. H. Heck.

The author drew attention to the vague character of the existing regulations as regards reduction of speed in foggy weather, and the omission of the element of size, which is of some importance. It is quite possible for a small vessel, when going at full speed, to be more under control than a large steamer going at half speed. By theoretical investigations, which the author gave in an appendix, he arrived at the following results:

(1) Two steamers of different maximum speeds, but of equal size and displacement, when going at full speed, can be stopped in the same distance by the reversing of the engines. Showing in vessels of equal dimensions and form, but of different maximum speeds, that in foggy weather the faster vessel can go at a greater speed, and still be under the same control as the slow vessel.

(2) If two vessels of different maximum speeds, but of equal size and displacement, are going at equal speeds, the fast vessel would be under greater control, and could be stopped in a lesser distance, by the reversing of the engines.

(3) A vessel when in the light condition is under much greater control then when loaded, and can be stopped in a shorter distance by the reversing of the engines. In thick or foggy weather, therefore, a loaded vessel should go at a less speed than when simply making a voyage in ballast.

(4) Of two steamers of the same form and speed, but one having twice the dimensions of the other, the smaller vessel is more under control, and can be stopped in half the distance. In other words, the larger vessel would go through twice the distance after the engines were reversed before she would come to rest. From this it follows that if the condition of the weather renders a reduction of speed prudent, then the reduction of speed should be greatest in the case of larger vessels.

(5) Of two vessels of the same size and form, but having different maximum speeds, while both can be stopped in the same distance by the reversing of the engines, the faster vessel will come to rest in less time than the slow one. The loss, of course, of a few seconds by a captain or mate being undecided what to do would be of more consequence in the case of a fast than a slow vessel.

(6) Of two vessels of similar form and speed, but of different dimensions, the smaller vessel will come to rest in less time than the larger; more promptness is, therefore, necessary in the case of the larger vessel.

(7) Steamers traveling between ordinary speeds will go an enormous distance before coming to rest if the engines are simply stopped, but not reversed; this distance being at least from twenty to thirty lengths, according to the speed and size of the vessels, showing how much less under control a sailing vessel is when compared with a steamer.

In conclusion the author advocated that experiments on retardation and steering qualities of vessels should be made during the course of the ordinary speed trial trips, to enable seamen to get more reliable and accurate information in regard to the vessels under their charge.

The Appointment of Chief Justice Fuller.

The President of the United States on April 30 appointed Melville W. Fuller, of Chicago, to the position of Chief Justice of the United States Supreme Court, lately rendered vacant by the death of Judge Waite. The new incumbent was born in Augusta, Me., February 11, 1838. His mother was a daughter of Chief Justice Martin Weston. He graduated at Bowdoin College in 1853, having as a classmate E. J. Phelps, United States Minister to England, the latter having been also spoken of as a candidate for the same office. After practicing law in Augusta, beginning in 1856, and also editing a paper called *The Age*, he decided to try the West, and established himself in Chicago. There he has since remained. In 1861 he was elected a member of the State constitutional convention; in 1862 he was elected to the legislature; and he was a delegate to the Democratic conventions of 1864, 1872, 1876, and 1880. He has had a large practice in the law, including many Supreme Court cases.

The Smith Observatory, Geneva, N. Y.

By the liberality of Mr. William Smith, of Geneva, a first-class astronomical observatory has been established at that place, fully equipped with instruments of the highest standard, to be known as the Smith Observatory. Prof. Wm. R. Brooks, who has been for many years well known to readers of the SCIENTIFIC AMERICAN by his contributions to astronomical science from the Red House Observatory, at Phelps, N. Y., has removed to Geneva, N. Y., where he will in future carry on his astronomical work under more favorable auspices, as director of the new Smith Observatory. The many valuable discoveries in astronomy heretofore made by Prof. Phelps not only attest his competency and indefatigability, but afford the best promise of success in his new location.

Ten Cows Hanged.

Samuel Stevens, a milk dealer of Monroe, Conn., on going to his barn the other morning, found the entire flooring of his cow stables had given way during the night and precipitated his ten cows into the opening. Nothing remained but the stanchions to which his stock were fastened, and from these hung ten dead cows.

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THE CELESTIAL WORLD.

A REMARKABLE METEOR.

L'Astronomie gives a description of a remarkable meteor that appeared in Cochin China on October 25, 1887. It was seen at Tay-Ninh and at Saigon, and moved from west to east. It was of a globular form, its diameter being more than half that of the full moon. Its color was a brilliant white with a violet tinge, and it was followed by a long train of light continuing nearly thirty seconds.

A few days after the occurrence, the chief official of Tay-Ninh received a letter from the chief official at Triem-Hoa, announcing that in the village of Than-Duc—south of Tay-Ninh—an uncommon animal had appeared, its advent being accompanied by rain and peals of thunder. "The animal had returned to the sky!" It had, however, left behind traces of its presence in the form of a hollow place in the soil 65 feet long, 16 feet wide, and 13 feet deep. The official felt that it was his duty to make a report of the extraordinary phenomenon.

A comparison of the time and the direction of the movement left no doubt that the passage of the meteor of October 25 had caused the commotion at Than-Duc.

A party of observers was sent to Than-Duc to investigate the matter. It was found that the meteor touched ground on a rice plantation, near a small stream that serves as a boundary line between Than-Duc and Hiep-Hoa. The impression left on the soil was that of an elongated pear. Diligent search was made for the meteor, but it was impossible to find the least trace of it either beneath the earth or in the neighborhood. The conclusion was inevitable. The meteor had ricocheted. This opinion was confirmed by the intelligent observers in the neighborhood, and by the artillerymen, who heard, as the meteor descended, first a great noise like the blow of a whip lash, and then a succession of rumblings, gradually dying away—sounds characteristic of ricochet movement. The meteor after the first impress, probably, just skimmed over the soil, losing in the shock only a small portion of its force. It then rebounded with enormous velocity, and finally fell at a great distance from the point where it first touched ground.

Meteors with a ricochet movement, and meteors containing small diamonds, like the one that recently fell in Russia, are something new in the history of the meteoric family, and strengthen the hope that at some future time one of these celestial bodies may pay us a visit and bring internal proof of the existence of animate life in other worlds than ours. A fragment of fossil or a bit of architectural work would be more welcome than the discovery of a new planet, or half a dozen moons, or the return of the bright star of 1572, for it would give tangible proof of the existence of life in other worlds than ours, the most interesting of the pending problems of astronomy.

THE CONJUNCTION OF JUPITER AND BETA SCORPII.

An unusual event enlivens the planetary annals of May. The brilliant planet Jupiter is in conjunction with the second magnitude star Beta Scorpii. The exhibition comes off on the 20th at 10 h. P. M. The time is favorable for observation, and the actors in the celestial scene are easily visible. The observer has only to look upward in the southeastern sky at 10 h. P. M., and Jupiter will be recognized at a glance, with Beta Scorpii close to him on the north, only 2′ of sky intervening between planet and star. The celestial bodies will seem to touch each other, for 2′ of arc is a very narrow dividing line. This is the closest conjunction that takes place between a planet and a star during the year.

Jupiter was near the same star on January 24, passing 8′ south. He was then moving eastward, or in a direct course. He continued to move in this direction until March 23, when he began to retrograde, or move westward, passing close to Beta Scorpii on May 20. He will continue to retrograde until July 23, when he commences to move eastward, or in a direct course. This brings him again in the neighborhood of Beta Scorpii, with whom he is in conjunction for the third and last time on September 22. He is then 28′ south of the star.

The conjunction will be curious and interesting to observe, either with the naked eye or with an opera glass, or, best of all, with the telescope, where the star will seem to belong to the retinue of Jupiter's satellites.

Insect Pests.

Dr. J. A. Lintner, the well known entomologist, of New York, says there are in the world 320,000 species of insects; 25,000 of these belong to the United States, and about 25,000 prey upon the productions of man; 7,000 or 8,000 of these could be considered as being fruit pests. On the apple alone 210 species are known, and probably more extended investigation will increase the number to 300. The future successful fruit grower should study entomology, and be acquainted with insects and their habits, so as to be able to tell friends from foes. Professor Lintner recommends the study of feeding and habits as a guide to the use of insecticides, which should also receive notice.

Military Notes.

The part that cavalry is likely to play in war seems to be more rather than less important than we have been taught to believe. Up to a quite recent date we were told that, because of the quick-firing small arms, there would be no use for cavalry, for that they could not hope to get within striking distance. We all remember to have read how the French squares in the battle of the Pyramids beat the famous Mameluke cavalry, 10,000 strong, under Mourad Bey; and if muzzle loaders could do this, how could horses avail against magazine guns? But supposing the Mameluke cavalry to have had machine guns like those the Continental cavalry are now being re-enforced with, perhaps then the result would have been quite different, and forty centuries would have looked down upon broken squares and inriding horses and routed infantry—the flying battery of machine guns being brought into play before the charge.

The havoc wrought by the French mitrailleuse in the Franco-German war realized the promises made for it by the French war minister Lebœuf, this, so far as is known, being the only instance where his estimates proved reliable. Yet the only use made of the experience with the machine gun, up to quite recently, was to increase the number assigned to each brigade of infantry. Now, however, both Germans and French are practicing the cavalry in their use, in the wise belief that the next best thing after having a destructive arm is to get it quickly to work upon an unprepared enemy.

So far, all efforts, and they have been many and untiring, to supply the British cavalry with machine guns have failed, the "circumlocution office," of which General Wolseley complained so bitterly recently, being, no doubt, at the bottom of the trouble, though there is reason to believe that rivalry between the companies making the various types of machine guns has had something to do with the procrastinating policy that would seem to have been adopted at the war office. From time to time, excellent military authorities have pictured the potency of cavalry supported by machine guns, declaring that infantry, if not similarly armed, could not oppose such a force, the machine gun having a range of 3,500 yards, nearly three times that of the effective even of the improved rifle. Unless they occupied a fortified camp, they would have to run for it, which, with horsemen in pursuit, would not better their chances of safety, but, on the contrary, place them at the mercy of the troopers.

The Germans claim that their musketry instruction is enough better than the French to make up for the superiority of the French magazine rifle, the *Heeres Zeitung* declaring recently in a confident tone that "a fairly good rifle in the hands of marksmen well commanded, all else being equal, is more effective than a superior rifle can be in slovenly and too confident hands." No one will doubt the truth of this who has seen large bodies of troops at work at the butts, nor can those who know how careful is German military instruction doubt that the arm used by German troops will be made the most of, so far as untiring drill will suffice to make up for natural awkwardness. But the men from the farming districts, the *Bauerleute*, especially those from Saxony, Wurtemberg, and Hanover, have big, clumsy fingers, and those who have seen the time they make over the simple and heavy apparatus of the needle gun will be slow to believe that they can approach the French in the skillful use of the mechanism of the magazine rifle. Under the new regulations the German soldier is taught to fire standing, kneeling, lying down, behind a parapet, from a shelter trench, behind a tree, and at a running target. Attempts are making to teach the soldier how to judge distance by sound, that is to say, by the striking of the first bullet fired; and knowing the adjustment of the sights and the wind gauges for three ranges, 400, 800, and 1,200 meters, he is expected to be able to estimate a new range by means of these known points in his practice firing.

The British military authorities seem to be of one mind as to the dispositions to be made of the fleet in case of war. They say that there should be two great fleets, one in the English Channel, the other in the Mediterranean, and that their combined effectiveness should more than equal the combined fleets of any two powers. At the same time, they would have ships guarding British interests on the Pacific, Indian Ocean, West Indies, and China stations. With so elaborate a plan as this, and such expectations, it is not at all surprising that expert naval critics should declare, as they are doing, that Britain is unready. Captain Beresford, who recently resigned his place in the Admiralty board, insists that 20 cruisers of the first class should be at once laid down, and the military press give it as their opinion that if unarmored ships are to be built, small vessels of high speed are to be preferred to big ones, like the Buzzard and Pheasant, that cannot make more than 12 or 14 knots an hour.

Henderson Steel.

A correspondent says: There has been recently erected at Birmingham, Alabama, a Henderson gas open hearth steel furnace, to make steel from the phosphoric pig iron of that locality. Its peculiarity consists in producing a measured amount of highly heated gas, which is burned with a measured quantity of heated air in the flues leading from the gas producer to the heating chamber, and in such manner as to produce perfect combustion, the elements being all so thoroughly mixed in the flame that it becomes homogeneous, and impinges in a downward direction upon the iron in the heating chamber, which, when lined with dolomite, causes the metal to yield most of its phosphorus in the form of vapor.

The pig iron made at Birmingham analyzes:

Combined carbon	1·871 per cent.
Graphitic "	1·7886 " "
Silicon	1·9597 " "
Phosphorus	0·6493 " "
Sulphur	0·3286 " "

This, when treated by the Henderson process, becomes tool steel by leaving in 0·75 per cent of the carbon. The pig is treated in the furnace with red fossil hematite ore, raw dolomite, and fluorspar. The time from charging the pig iron to pouring the steel is 5½ hours.

The steel analyzes:

Carbon	0·75 per cent.
Silicon	0·009 " "
Phosphorus	0·051 " "
Manganese	trace.

Experts at the railroad and other machine shops say it is equal to Mushet's, that they pay 48 cents per pound for wholesale. Mr. Vittur, a noted cutler at Atlanta, Ga., made some razors from it which he says are equal to those that he imports English steel for.

Pig iron and ore with 25 per cent of scrap steel produced soft steel, with use of flourspar and dolomite, in three hours from charging pig metal to pouring steel. It analyzes:

Carbon	0·20 per cent.
Manganese	0·78 " "
Phosphorus	0·075 " "

The analysis of the slags is:

Metal iron, as peroxide	8·190 per cent.
Silica	29·250 " "
Sulphur	0·095 " "
Phosphorus	1·1035 " "

The remainder of the slag is lime and magnesia. The pig and ore contained about 13·5 pounds of phosphorus, and there was 0·7 pound left in the steel; the difference, about 10¾ pounds, was volatilized. The iron ore used was 250 pounds of 45 per cent metallic iron, and there was about 200 pounds of slag to the ton of steel, so that about 85 per cent of the iron in the ore was reduced to metal, and added to the steel in the furnace. A large portion of the phosphorus in the ore was volatilized.

The vaporized phosphorus will be conveyed to ammonia refrigerating chambers and condensed to hydrous phosphoric acid, and afterward used for fertilizing, either by mixing it with lime or by sprinkling it over land.

The ores of Alabama range from 0·18 to 37 per cent of phosphoric acid. Pig iron smelted from mixtures that will give it 3½ per cent is readily converted to steel with but 0·05 per cent of phosphorus. The residue —except the small portion in the slag—is from 80 to 90 per cent of that in the pig and ore, and is vaporized and becomes an available by-product for the mere nominal cost of condensing it in water; 150 pounds of the acid may be thus produced per ton of steel, and is worth as much as the steel costs to make from pig iron, costing $8 per ton, or is worth $12 to $14.50 per ton in excess of the steel, which costs $11, if by-products are not saved. Royalties for use of the patents will be charged that will be commensurate with the advantages gained. Since the publication of the Henderson patents, in 1883, M. H. Moissan, a French chemist, has contributed several papers to the public journals, upon the vaporization of phosphorus, and utilizing it by condensing it with milk of lime for fertilizing.

The Henderson steel contains but one-third to one-half of the phosphorus of that usually present in Bessemer steel, which ranges from 0·10 to 0·15 per cent.

The Henderson furnace will produce four times as many charges per day as the regenerative furnace, as it has two working chambers. The molten iron from a blast furnace is poured into one of the chambers lined with sand, where it is treated with iron ore to remove silicon and half its carbon. This takes about 2 hours. The molten metal is then transferred to the other chamber, where all the carbon and the phosphorus are removed, and the scrap of the works is melted. That will take 2 hours. So that the melts or casts may be made every three hours, which gives an hour on each cast for repairs, and charging and tapping the metal. The consumption of coal in this way of working is about 3 bushels per ton of steel, which is about one-sixth of that used abroad in the Siemens furnace. The coal costs $1.75 per ton delivered, which is less than 3 cents per 1,000 cubic feet of combustible gas. It is of excellent quality, equal, in fact, to any mined in this country for this use.

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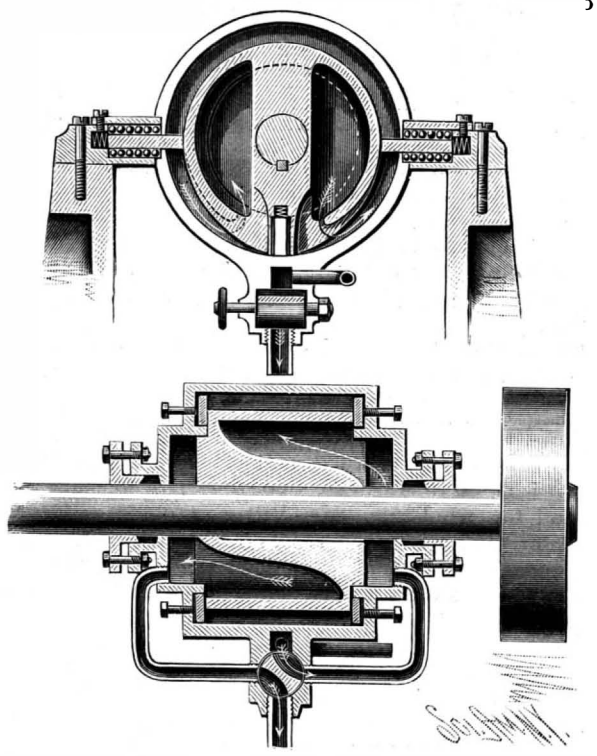
AN IMPROVED ROTARY ENGINE.

A rotary engine in which the steam is introduced into the piston, and the latter, which is eccentric, rotates in a circular casing or cylinder having yielding abutment blocks which bear against the periphery of the piston, has been patented by Mr. James E. Snevely, of Chetopa, Kansas, and is illustrated herewith through two vertical sections. The piston is keyed on a shaft passing through the casing and carrying a band pulley, the journal boxes being provided with suitable packing and retaining plates. Recesses are formed in the piston having an S-shaped partition between them,



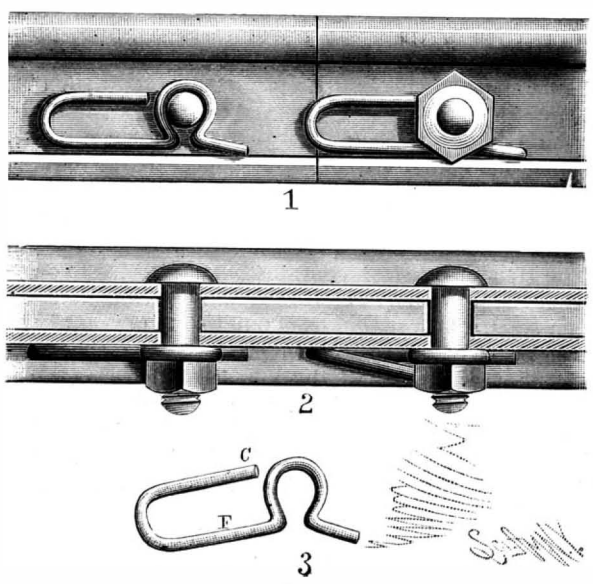
SNEVELY'S ROTARY ENGINE.

SNEVELY'S ROTARY ENGINE.

the steam chests, and by means of ports into an annular space between the casing and piston. The piston has an eccentric portion which has a perfect contact bearing with the inner wall of the casing by means of a yielding block in a recess on its periphery, the eccentric also acting alternately to press back abutment blocks adapted to slide on anti-friction ball bearings in recesses in the arms of the casing. The steam supply pipe connects with a passage communicating with a circular chamber in which is a rotary valve, by means of which steam may be directed into either of the branch pipes connecting with the steam chests at the ends of the piston, the arrows showing the direction of the steam when admitted into the right hand pipe. The valve chamber also connects with a steam discharge pipe, the valve being turned by means of a handle or wheel to direct the steam into one or the other of the branch tubes, when the opposite tube will form the outlet pipe. The configuration of the recesses in the piston are such as to cause the steam to effectively drive it, and the parts in frictional contact are so self-adjusting that when they become worn they will still form tight steam joints.

AN IMPROVED NUT LOCK.

A nut lock that is very simple and inexpensive, and well calculated for application to railroad rails and for



RENNIE'S NUT LOCK.

other uses, has been patented by Messrs. Frank and John Rennie, of No. 339 East Fifth street, Dayton, Ohio, and is illustrated herewith, Figs. 1 and 2 showing its application in securing rails, and Fig. 3 being a detail view. This nut lock is made of round or square rod iron or steel, bent into the form shown in Fig. 3. It can be made to fit all sizes of bolts and nuts, such as used on crossing switches and all railway joints, and is easily put on either new or old bolts and angle splices, saving the nuts, bolts, and ends of the rails from undue wear. The loop being placed on the bolt, with the straight part of the rod resting on the foot of the angled fish plate, and the nut carried to its place, the part, F, is forced into place, and a chisel or wedge is driven behind the bent portion, C, throwing it outward into the path of the corners of the nut, or a tool especially designed for the purpose may be employed for bending the arm, C. The nut cannot then become accidentally loosened until the arm is driven back to its original position. It is said that this nut lock has already given great satisfaction for its simplicity, efficiency, and durability, in railroad service.

Queer Name for an American War Vessel.

We read in one of the accounts of the launching of the new gun boat Yorktown and dynamite cruiser recently, at Philadelphia, that the latter's name was kept a profound secret, and that no one but Secretary of Navy Whitney knew of her name until she started on her slide into the waves, christened the Vesuvius. There was no mystery about the Yorktown, every one knew what she was to be called, as they have the rest of our ships, so soon as their keels were laid; but Vesuvius was kept back. Why, no one seems to know. If as a surprise, it succeeded, for our people *are* surprised, and justly so, that a United States man-of-war should be named after a foreign mountain. Are there so few mountains in our own broad land that could grace and dignify this boat, that an Italian one should be selected to be floated over our waters on the stern of this experiment—this Simon Pure Yankee invention?

It has been a custom, even if not a law by observance, to name all our war ships after our own States, rivers, mountains, villages, and hills, and are we now so devoid of these that our limited navy cannot be supplied with an appropriate one? Or is it that some one in authority is devoid of imagination, patriotism, or a dictionary? Our fathers had no trouble in their selections, *vide* the Congress, Constitution, Cumberland, Saratoga, Saranac, Kearsarge, Independence.

Better stop with Vesuvius, Mr. Secretary, or why refrain from calling our next ship the London, Moscow, Hong Kong, or Popocatapetl? J. O. D.

Improved Photographic Plates.

At a recent meeting of the Franklin Institute, Frederick E. Ives communicated an important discovery in isochromatic photography made by himself. After referring to the objections made to the process employing collodion emulsion and chlorophyl, which is claimed to be the only one published which shows a difference between a black and a deep red without over-exposing orange and yellow, he said: "At last I have succeeded in securing, by a surprisingly simple procedure, the full action of chlorophyl upon commercial gelatine bromide plates.

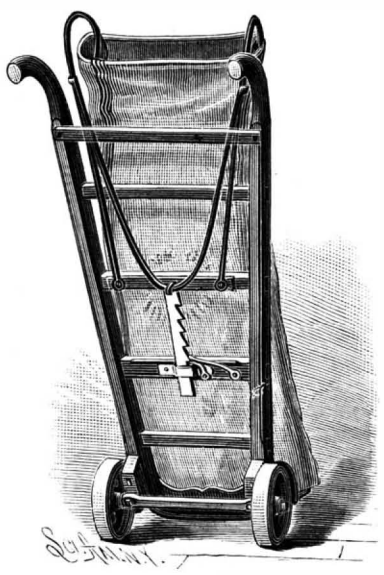
"The results are already superior to anything that can be obtained with cyanine. The degree of color sensitiveness obtained appears to bear a definite relation to the general sensitiveness of the plate employed, which should, therefore, be of the most rapid kind. They are prepared by flowing with the alcoholic solution of chlorophyl, *then drying* rapidly, *then soaking in water* for at least five minutes, after which they may be used at once. With the two year old chlorophyl employed the absolute color sensitiveness is fully equal to that of the best commercial 'orthochromatic' plates, and is so distributed as to be capable of giving far more accurate results; but the blue sensitiveness, which is greatly reduced by cyanine and erythrosin, is actually increased by chlorophyl, making it necessary to use an extra deep orange color screen with these plates."

AN IMPROVED STOCK TETHER.

A cheap, durable, and efficient tether, in which the parts are arranged to prevent the animal from becoming entangled in the tie rope, is illustrated herewith, and has been patented by Mr. William Overaker, of Hillsborough, N. C. The post is braced by properly arranged guy ropes, and to its upper end is bolted a bracket with tubular socket within which a vertical standard is held. The upper end of the standard is slotted, and in the slot is pivotally mounted a beam, normally upheld by a spring secured to the standard, and arranged to have a certain amount of play in a stirrup-like loop carried by the beam. A weight is attached to the short end of the beam, while to the long arm is secured a shackle by which a tie rope is attached to the beam, leaving the animal free to graze anywhere about the post within a radius equal to the combined length of the rope and the long arm of the beam, the slack of the rope being taken up as the animal advances toward the post, by the elevation of the free end of the long arm of the beam by the spring and weight. If desired, the spring may be dispensed with and the weight alone employed, there being different apertures in the beam through which the pivot bolt may be passed for properly balancing the beam.

AN IMPROVED BAG HOLDER.

A bag holder especially adapted for use with hand trucks, designed to hold the bag on the truck and at the same time to hold the mouth of the bag open, is illustrated herewith, and has been patented by Mr. Frank G. Fischer, of Harrold, Dakota Ter. It is mounted on a T-shaped frame, of which the vertical bar is notched and held to slide in a keeper, preferably secured to the rear of a cross bar of the truck, the notches in the bar being engaged by a pivoted pawl, held in place by a spring, whereby the frame can be adjusted at the desired height, according to the bag to be filled. On the cross bar of the frame are pivoted the lower ends of two arms, extending upward and being bent over and downward at their upper ends, which carry disks, each provided with a number of projections adapted to engage the inside of the bag.

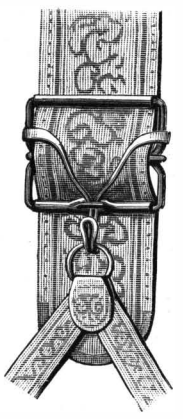


FISCHER'S BAG HOLDER.

These arms are pressed apart by a U-shaped spring, secured in its middle to a staple fastened on the cross bar of the frame, the ends of the spring having ears through which pass the upwardly extending straight parts of the arms. When the bag holder is attached to the truck, the supporting arms rest against the front of the top cross bar of the truck, the operator releasing the bag, as its end is thrown from the foot of the truck, by pressing the bent parts of the pivoted arms toward each other, thus releasing the disks from the sides of the bag.

AN IMPROVED SUSPENDER BUCKLE.

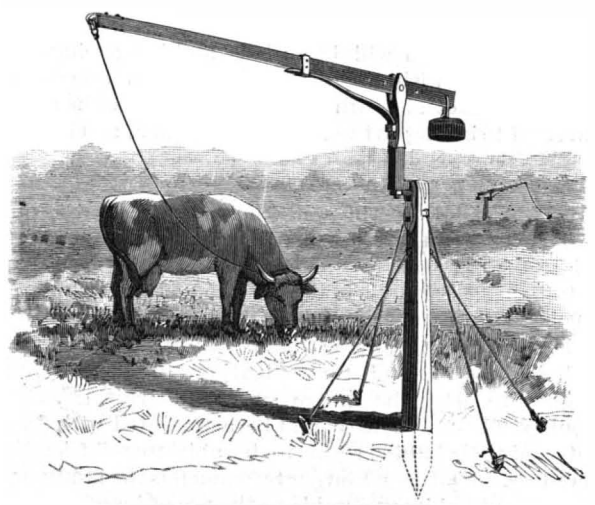
A suspender buckle in which the clamp is securely held in place and firmly guided on the side bars is illustrated herewith, and has been patented by Mr. William J. Walters, of Prospect, N. Y. The bottom crossbar of the buckle frame has in its middle an aperture, preferably made by bending part of the crossbar outward and securing to the crossbar a sleeve which has part of its middle cut away at the front. The aperture may also be formed by splitting the middle part of the crossbar, or by forming a loop therein, and dispensing entirely with the sleeve. Continuations of the inclined portions of the clamp pass through the aperture, whereby the clamp is prevented from moving sidewise, and obviating a binding of the bearings on the side bars of the buckle frame, so that the clamp is readily adjusted, and at the same time its hooked part is prevented from passing above the lower crossbar.



WALTERS' SUSPENDER BUCKLE.

Improved Mail Bags Still Needed.

The recent call of the Postmaster-General for proposals for supplying the United States Post Office Department with improved letter pouches and mail bags resulted in the presentation of no less than fifty-one new contrivances, all of which were rejected. Each party was required to furnish two bags, fully completed for use, but not to be adopted unless, in the opinion of the committee, they should appear to be of value for the service. There is a further opportunity for ingenious people to see what they can do.



OVERAKER'S STOCK TETHER.

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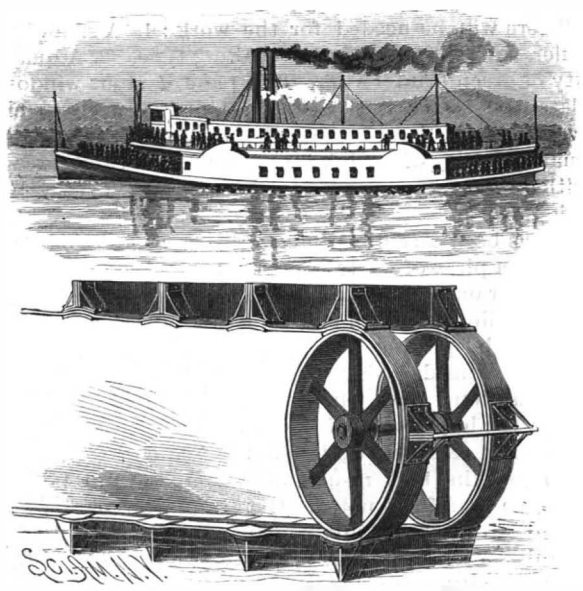
AN IMPROVED PADDLE-BELT.

A special construction of an endless belt armed with paddles, and adapted to run over end pulleys, to give a long, straight stroke in the water, in propelling vessels, is illustrated herewith, and has been patented by Mr. William H. Silsby, of Martin's Ferry, Cal. Beneath the ends of each paddle the belt is bent to the curve of the pulleys, and to this curved portion are riveted or

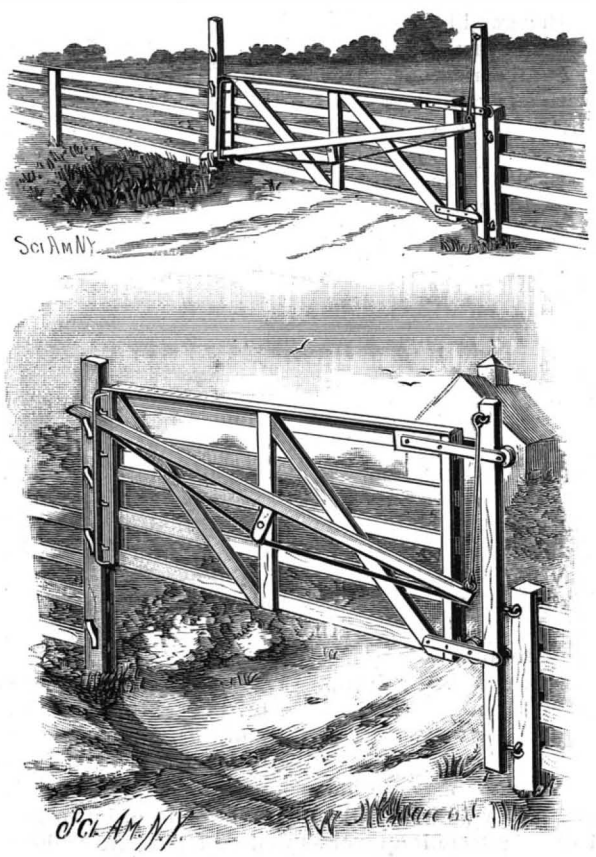


SILSBY'S PADDLE-BELT.

otherwise secured rigid plates, in the shape of cylindrical segments conforming to the pulleys, these plates serving as a base for the rigid attachment of paddles, while causing the bands in passing over the pulleys to embrace them as they would if wholly flexible. The paddles have their feet riveted to the middle part of the plates, and are further strengthened by inclined braces having their other ends secured to the outer ends of the plates, whereby they are firmly held in a position perpendicular to the bands. The straight draught of such a paddle belt gives a large hold on the water, and, where two of them are used on the bottom of a boat, great facility in turning is afforded by running one backward and the other forward.

AN IMPROVED GATE.

The illustrations herewith represent a patented gate of the Pearl Gate Company, of North Lansing, Mich., one of the views showing the gate elevated to allow small stock to pass under. A heel post is attached to the hinge post by means of an eye and staple hinge, and the upper and lower rear corners of the gate are provided with brackets, the upper one of which has an anti-friction roller which bears against the outer face



A LIFTING AND SWINGING GATE.

of the heel post, while the lower one has a similar roller bearing against the inner face of the heel post, these brackets loosely embracing the heel post, so that the gate can be readily raised and lowered. At about the center of the gate a lever is fulcrumed, its rear end being supported by a link from the upper end of the heel post, while the front stile of the gate has a series of staples, and a guide rod or bracket, between which and the gate the free end of the lever projects enough to overlap the latch post, having stops at varying heights, these stops being at different heights from the staples on the gate. As the weight of the gate is sustained by the lever, it is provided with a truss rod, whereby it may be made lighter. When the free end of the lever rests upon any one of the stops on the front stile of the gate, the latter is prevented from sliding down to the ground, and may be swung upon its hinges. When the gate is closed, the lever should be detached from its rest and allowed to drop to its lowest position. The gate automatically latches itself as the free end of the lever strikes the latch post, the lever being thus thrown off from the stop on the outer stile of the gate, and being caught on the stop of the latch post next below. If it is desired to hold the gate in a higher or lower closed position, for allowing small stock to pass under, such adjustment is readily obtained by placing the free end of the lever in one stop or another, thus moving the gate vertically.

A Four Million Dollar Ship.

A great sensation was recently made at Newcastle-on-Tyne, when the new war ship Victoria was slowly towed from Elswick, down the river and out to sea, by seven steam tugs. The river banks were lined with people on both sides at all the more important centers of population. The voyage was accomplished without any hitch. At the Swing Bridge there were very few inches to spare in the width of the opening, and at one time fenders had to be used to soften down a slight collision. In crossing the bar, thanks to the work of the Tyne commissioners, there was plenty of depth of water, notwithstanding the heavy draught of the enormous vessel. On reaching the open sea several hours elapsed while the compasses were being adjusted, and then the vessel, propelled by her own engines, was quickly out of sight. On arriving at Sheerness, she was taken in charge by the Medway Steam Reserve authorities. Some time will elapse before she is fit for active service, but no efforts will be spared to finish her as soon as possible. Her cost to the country will be over $4,000,000.

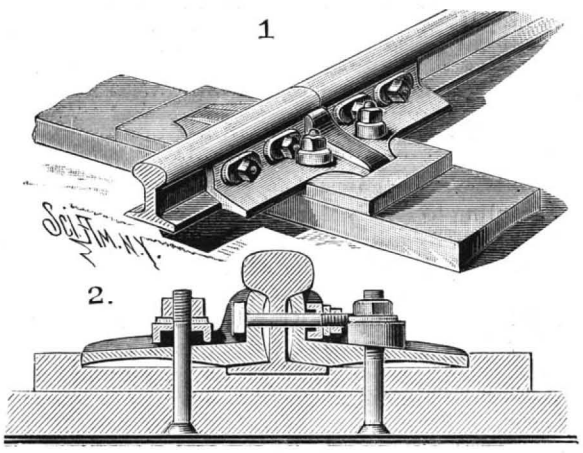
AN IMPROVED APPARATUS FOR EXAMINING ORES.

An apparatus for examining rocks, to determine whether they contain metallic ores, has been patented by Messrs. John R. Williamson, of Seattle, Washington Territory, and William W. Hickies, of Oakland, Cal., and is illustrated herewith, one view showing the examination thereby of rocks *in situ*, and the other representing the examination of detached rocks. One pole of a battery is connected with one terminal of a telephone receiver by means of a wire in the usual way, the remaining pole of the battery being connected by a conductor with a brush provided with a suitable handle, while the remaining terminal of the telephone receiver is connected by a conductor with a similar brush having a like handle. In examining rocks in place, the two brushes forming the terminals of the conductors connected with the telephone and battery are drawn along the face of the rock, while the telephone is held to the ear of the operator. If the rocks contain metals they conduct the current, and the movement of the brushes along the rough face of the rock causes variations therein, which are audible through the telephone, there being no sounds produced when the rock contains no minerals. In examining detached portions of rock, the latter are placed upon a conducting plate connected with the telephone through the battery, and the brush at the other terminal is touched to the rock, which, if it contains metal or metallic ores, will cause sounds to be heard in the telephone. Instead of using the conducting plate, the fragments of rock may be examined by being placed upon insulating material, and bringing both brushes in contact with each specimen. Other means of indicating the passage of the current may be employed instead of the telephone receiver, as the operator may place the conductors on his tongue and note the sensations due to the completion of the circuit, or a galvanometer may be employed, or a paper saturated with salt, which will be decomposed by the current, making marks on the paper, although the telephone receiver is preferable from its portability and effectiveness and the ease with which it is managed.

For further particulars with reference to this invention address Mr. John R. Williamson, Seattle, Washington Ter.

A COMBINED TIE, CHAIR, AND FISH PLATE.

A novel construction of tie, chair, and fish plate combined, for holding railway rails in position, and clamping them to the ties, is illustrated herewith, and has been patented by Messrs. Daniel Harrington and Morris A. Keane, of No. 149 Albany Street, New Brunswick, N. J. The chair has a compound recess, in one division of which the rail fits, as shown in Fig. 2, while in the other division fits a horizontal member of an angular fish plate having its under surface partially conformed to the contour of the rail flange and partially concaved, its vertical member being also concaved on its inner bearing surface. The means for binding the fish plate to the rail and to the chain will be readily seen from the sectional



HARRINGTON & KEANE'S CHAIR AND FISH PLATE.

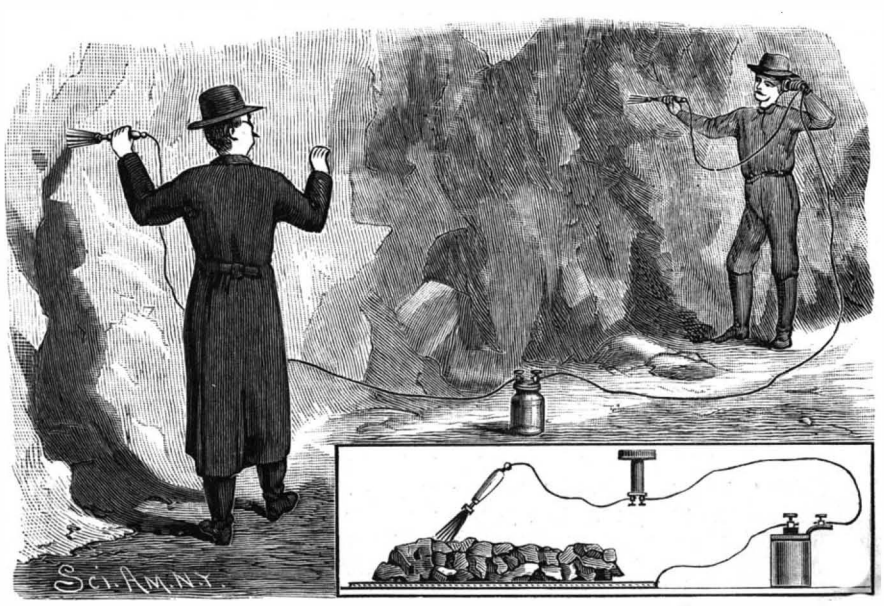
view, the under surface of the sleeper being concaved. When the device is applied simply as a chair for clamping rails at any part of their length, the construction is similar, except that the vertical member found in the fish plate is omitted. The sleeper may be made of any suitable material, but iron is preferred.

AN IMPROVED FRUIT JAR.

A fruit jar combined with an adjustable ring to complete or form the sealing groove for the cap is illustrated herewith, and has been patented by Messrs. John B. and Robert Johns, of Massillon, Ohio. The jar has a sealing surface blown or formed on the outside of its neck, in such way that it will not have to be taken back to the furnace to form the rim or groove. The cap is preferably made of thin metal, and made to

JOHNS' FRUIT JAR.

slope downward and outward on the exterior of the neck to a point below which is an annular groove, wherein the wax or sealing composition passes under the edge of the cap in closing the jar. The adjustable ring which forms the sealing groove for the cap inclines outward in an upward direction when in place, its ends being preferably made to overlap one another, and the outer end bent outward to form a lip for convenience in opening the ring, which is a spring one, self-adjustable to the jar. The ring is applied to the jar after the latter has been charged with fruit or other contents, the cap being then put in place and the sealing composition subsequently filled in. To unseal the jar the ring is first removed, thereby exposing the wax or sealing composition so that it can be readily knocked or picked off.



WILLIAMSON & HICKIES' APPARATUS FOR EXAMINING ORES.

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The Master Car Builders' Committee on Standards and Appliances for the Safety of Trainmen.

The railroad commissioners of the State of New York report that during the year ending September 30, 1887, there were 199 railroad employes killed and 896 more or less severely injured in the performance of their duties. These accidents are classified as follows:

	Killed.	Injured.
Fell from train, engine, or cars, or getting on or off trains	48	152
Striking low bridges, switches, tunnels, etc	8	9
Coupling or uncoupling cars	20	437
Walking or being on the track	102	88
Catching foot in frog or between rails	4	7
Derailment	1	19
Collisions	6	40
Other causes	10	144
	199	896

According to Poor's Manual, the number of locomotives owned by railroads in the State of New York in 1886 was 2,722, and in the whole country 26,415. It will be quite safe to say that there were ten times as many locomotives in the whole country as there were in New York during the period covered by the railroad commissioners' report. If the average number of persons killed or injured per locomotive is the same elsewhere, the number of casualties to railroad employes in the whole country would be ten times the above figures, or a total in round numbers of 2,000 killed and 9,000 injured.

No pretense is made that this estimate gives the number of employes killed and injured with anything more than an approximation to accuracy. It must be remembered, though, that whatever errors there may be in the reports of accidents to the railroad commissioners, and of the number of locomotives in the country, are errors of omission, and that probably both the number of accidents and of locomotives are greater than reported, which would make the above estimate too low rather than too high. Nevertheless, with any reasonable deduction the record of frightful suffering, pain, and sorrow will be more than sufficient to emphasize the following inquiries, the aim of which is to elicit information that will indicate how the number of such accidents may be diminished.

All railroad officers and employes, whether members of the Master Car Builders' Association or not, are therefore requested to answer the following questions:

1. What defects are there in the present construction of cars and locomotives which cause accidents to railroad employes by falling from trains, engines, or cars, or of accidents of getting on or off trains?
2. What changes could be made in cars or locomotives which would diminish the number of such accidents?
3. What kind of couplers and dead blocks are the most dangerous to employes in coupling cars?
4. What kind of coupler and dead blocks do you think are the least dangerous to employes?
5. Has the introduction of automatic couplers thus far lessened the danger of coupling cars?
6. Would the general introduction of automatic couplers in your opinion diminish the danger of coupling cars?
7. Can you suggest any way of lessening the number of accidents to employes from "walking or being on the track"?
8. How can employes be prevented from "catching their feet in frogs or between rails"?
9. In what way may any other kinds of accidents to employes be prevented or the number lessened?

All railway officers and employes who see this circular are earnestly solicited to answer it, and thus add the weight of their testimony in helping to reduce the terrible sacrifice of life and limb which is annually exacted from our railroad employes.

Soapstone Paint for Iron.

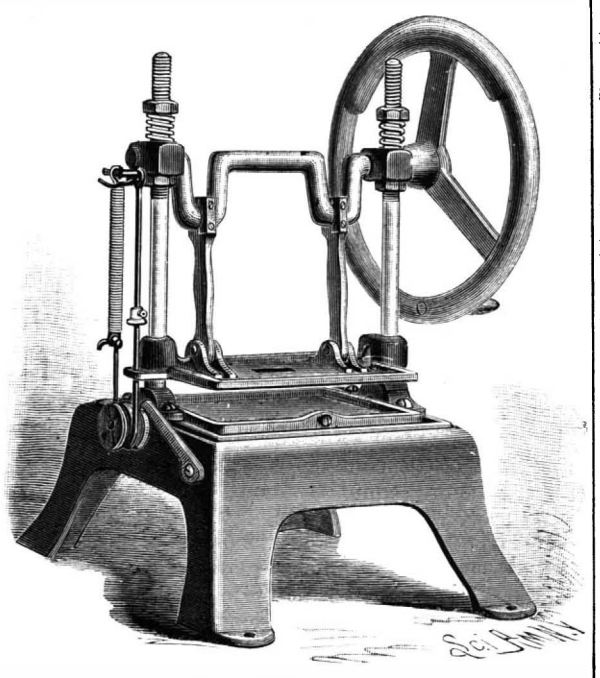
Both in China and Japan, soapstone has long been largely used for protecting structures built of soft stone and other materials specially liable to atmospheric influences. It has been found that powdered soapstone in the form of paint has preserved obelisks formed of stone for hundreds of years, which would, unprotected, have long ago crumbled away. Seeing what a preservative quality this material has, it is specially of interest to shipowners to learn that Mr. Goodall has, in the course of many experiments, "found nothing to take hold of the fiber of iron and steel so easily and firmly as soapstone." For the inside painting of steel and iron ships, it is found to be excellent. It has no anti-fouling quality, but is anti-corrosive.

A Hero of the Throttle.

In the recent accident at Huntingdon, says the Philadelphia *Ledger*, Engineer Robert Gardner, perceiving that a collision between his own train and another was inevitable, stayed at his post, kept his hands on the throttle and brake, and so met his death. While being lifted from the wreck, he asked if any of his "passengers" had been killed, and when informed that they had all escaped, he said, regardless of his own mortal hurt: "That's good, lay me down. Goodby, boys."

AN IMPROVED SELF-INKING PRINTING PRESS.

A press which has a revolving bed adapted to serve as an inking pad upon one face and platen on the other face is illustrated herewith, and has been patented by Mr. Thomas H. Cole, of 396 Broadway, East Albany, N. Y. The rubber or metal type are firmly fixed, face downward, on the under surface of the type carrier, which moves up and down between the vertical standards as the crank shaft is operated by the hand wheel. Centrally under the type carrier is journaled a block,

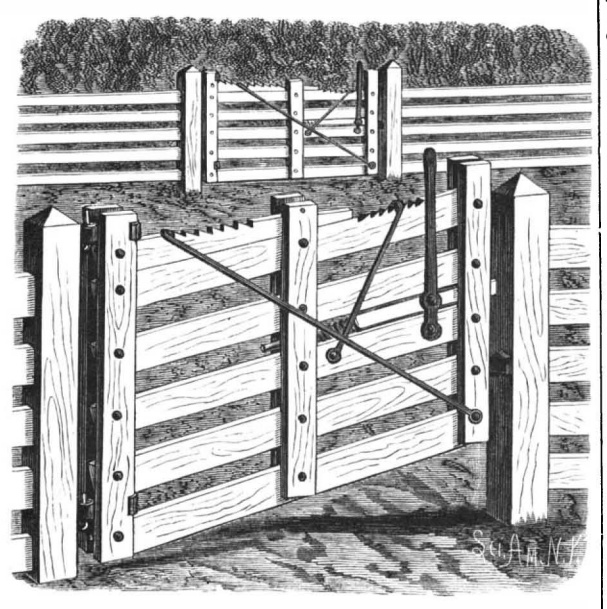


COLE'S PRINTING PRESS.

upon one trunnion of which is keyed a grooved wheel, around which passes a cord attached to one end of a spiral spring, the other end of the cord being fastened to the end of the type carrier, the arrangement being such that on each upward motion of the carrier the block is caused to make one-half of a revolution, remaining stationary on the downward motion. One side of this revolving block forming an ink pad, the type on the carrier are inked by one down stroke. As the carrier rises, the other side of the block is presented, on which the card or paper to be printed is placed, when the impression is given by the next down stroke, the following reversal of the revolving block, to present the inking pad uppermost, operating also to deposit the printed matter in any suitable receptacle beneath the revolving block.

AN IMPROVED GATE.

A gate adapted to open fully sidewise, or to afford a partial opening below the gate, is illustrated herewith, and has been patented by Mr. Judson N. Hatcher, of Americus, Mo. Its longitudinal rails are pivotally connected to three pairs of uprights, and a metal rod, bent double to form a stirrup, is pivotally connected to the lower outer corner of the gate, its upper cross-bar being adapted to engage any one of a series of notches or teeth on the upper edge of a board pivotally held on



HATCHER'S GATE.

top of the gate between the inner uprights. This board moves freely on the top rail as the gate is raised or lowered, the stirrup rod engaging the different notches to hold the gate in a raised position. A similar stirrup rod, pivotally connected near the middle of the gate, is adapted to engage notches or teeth in the upper edge of the outer part of the top rail of the gate, the engagement of both stirrups distributing the strain and increasing the strength of the gate. The gate latch is surrounded by a spiral spring on its inner end, to hold the latch in its outer position, the latch being moved laterally to open the gate by a vertical lever fulcrumed on one of the gate rails.

[BOTANICAL GAZETTE.]

How to Make Leaf Prints.

Several years ago, I devised a method of taking leaf prints of marked beauty, and a specimen of the work recently sent to Dr. Gray elicited the reply: "It is a new way. Better send account of it to *Botanical Gazette*," etc. I do so, prompted by the belief that the method may be of actual usefulness to the botanist, as well as a refining recreation for those who love nature "on general principles."

There will be needed for the work: 1. A small ink roller, such as printers use for inking type. 2. A quantity of green printer's ink. 3. A pane of stout window glass (the larger the better), fastened securely to an evenly planed board twice the size of the glass. A small quantity of the ink is put on the glass and spread with a knife, after which it is distributed evenly by going over in all directions with the ink roller. When this has been carefully done, the leaf to be copied is laid on a piece of waste paper and inked by applying the roller once or twice with moderate pressure. This leaves a film of ink on the veins and network of the leaf, and by placing it on a piece of blank paper and applying considerable pressure for a few moments, the work is done, and when the leaf is lifted from the paper, the impress remains with all its delicate tracery, faithful in color and outline to the original.

To get the best results, however, several points must be carefully noted. Get a quarter or half a pound of dark green ink, which is put up in collapsible tubes, costing from 50 cents to $2 a pound, according to quality. As sold, it is invariably too thick for this purpose, and should be thinned by adding several drops of balsam copaiba to as much ink as may be taken on a salt spoon.

Much depends on the proper consistency of the ink. In inking, the leaf is apt to curl on the roller, but it should part readily from it. In case it sticks tightly, the ink is too thick. Take care that the ink is evenly distributed on the glass and roller, as it is essential that each part of the leaf receives an equal coating of ink. If the leaf is large, ink it part by part, keeping the roller supplied frequently. A roller three inches long, costing 40 cents, will answer for all small leaves and branches of plants. (Clean the roller with benzine after using.) If the leaf is finely veined, the lower surface makes the better print, but if the veins are coarse and large, the upper surface may be used. If the specimen is fleshy or brittle, allow it to wilt until it becomes more pliable, or, if necessary, it may be pressed and dried first. In most cases the best copy is obtained after taking one or two impressions, as the leaf takes the ink better after several applications. A good quality of unsized paper that is made slightly damp by putting in a cellar several hours before using is best for general work, but in other cases well sized paper will take a copy that will allow a foliotype (may'I coin the word?) to bear inspection side by side with a good lithograph. I find a copying press very valuable in making the impression, especially if the leaf is at all coriaceous. If it be soft, it should be covered with a few thicknesses of newspaper. If it is irregular in thickness, paper may be laid over the thin parts, so that equal pressure is received. This is necessary with all leaves that have thick stems. If the leaf or branch is very irregular or delicate, or in the absence of a press of any kind, the specimen may be covered with several layers of paper, and held in place with one hand while the pressure is applied with the thumb or palm of the other hand, as required.

These particulars are as complete as practicable. Experiment will lead to many improvements in details. Employ tact and neatness, and you will be surprised at the result. For illustrating monographs and similar papers where the number is too limited to warrant an expensive lithograph, for identifying a rare specimen, or as an adjunct to an herbarium combining portability, unalterability, and beauty withal, the method seems particularly fitted. But aside from this, others may find a delightful and instructive recreation in taking prints of the entire flora of the old farm, the trees of a certain grove, the native annuals of a county, the ferns of a State, or any other special field that seems most inviting. Such copies may be taken in a blank book suited to the purpose, or, better, take them on single sheets of uniform size, as in this way imperfect copies may be thrown out, and when the work is completed they may be named, classified, and bound, making a volume of real value and worthy of just pride. I would esteem it a favor as well as a pleasure to hear personally from any who may employ this method in any way, the coming season, concerning the progress of their work, with its attendant imperfections and successes.

HORACE M. ENGLE.

Marietta, Pa.

Silver Plating Solution.

Dissolve in a pint of distilled water 50 grains of silver nitrate and 8½ oz. av. of potassium iodide. Employ a current of moderate strength. When a sufficiently thick deposit has been obtained, wash the object with a solution of potassium iodide in water (1:4), then with pure water, and burnish.

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LAUNCH OF THE YORKTOWN AND VESUVIUS.

(*Continued from first page.*)

minutes later the Vesuvius followed her. The larger of the two vessels was the United States gunboat No. 1, henceforward to be known as the Yorktown. As she started down the ways she was named by Miss Cameron, daughter of the Hon. Don Cameron, of Pennsylvania. The ship is an unarmored vessel. Her length is 230 feet, width 36 feet, with a mean draught of 14 feet. She measures 1,700 tons.

Having no projecting keel on her bottom, bilge keels are provided, one on each side. These are designed to counteract any undue tendency to rolling. Her bow, which is strengthened internally, projects forward below the water line, so as to form an efficient ram. The stem is adorned with quite an elaborate carving in the place of a figurehead, and near the top, directly in the line of the stem, an ominous opening appears, whence it is proposed to eject torpedoes. The stern overhangs the rudder to such an extent as to appear quite ungraceful when out of water.

Within the hull little is in place, except portions of the bulkheads and decks. She will be well divided into water-tight compartments. The coal bunkers are to be arranged along each side, so as to afford protection to the machinery. They alone are to have a capacity of 400 tons of coal, and will offer a protective body of coal about nine feet thick. Across the ship, within the hold, an arched deck is carried. This springs on each side from a line three feet under water, and rises at the center to the water level. It is of three-eighths steel plates. Under this deck are the magazines, steering gear, and boilers. Six sponsons are provided for guns, and the six principal pieces will be of six inches caliber. She is built throughout of steel. She will be provided with a full electric light plant, and all her equipments will be of the most improved and modern type.

The ship is to be propelled by twin screws, carried by 9½ inch shafts of Whitworth fluid compressed steel. The shafts are hollow. For each screw a horizontal triple-expansion engine is provided. These engines, and those of the Vesuvius, will be illustrated in a succeeding issue of the SCIENTIFIC AMERICAN. The three cylinders are respectively of 22 inches, 31 inches, and 50 inches diameter, and the stroke of each piston is 30 inches. The cranks are equally spaced as regards angular disposition. A horizontal engine, arranged for driving a screw shaft in a ship, fills up a large space laterally, for which reason the engines are arranged one forward of the other, the order of the cylinders being reversed, one engine having its low pressure cylinder forward and the other one having its low pressure cylinder aft. One shaft, therefore, exceeds the other in length.

The type of boiler adopted for both the vessels is a modified locomotive boiler, with corrugated cylindrical fire boxes set within the shell. They are built to carry 160 pounds of steam, each ship having four.

The engines of the Yorktown have heavy composition journal boxes, and are metallic packed. The valves are cylindrical and balanced. The valve gear, Marshall's type, is worked by an auxiliary steam cylinder, so that without effort the engine with its three cylinders can be instantly reversed by a single hand. The steam boilers and engine are to develop 3,000 indicated horse power, and a speed of 17 knots is expected.

The United States pneumatic dynamite gun boat, as she descended the ways, was named the Vesuvius, by Miss Breckenridge, daughter of Congressman Breckenridge, of Kentucky. Our readers have been informed of the nature of her armament as regards its general features—the Zalinski torpedo gun.

The recent experiment upon the Silliman was fully illustrated and described in our columns.*

The accuracy and efficiency of the weapon can be judged of from the record. But while that trial, successful as it proved, was executed with an eight inch gun, the new vessel is to carry three guns of sixteen inch caliber. Vastly greater destructive powers will be developed by them. They will throw projectiles each containing six hundred pounds of explosive gelatine a distance of over a mile. The guns are to be capable of maintaining a rate of discharge of two projectiles per minute.

The three tubes are to be placed forward in the ship, their ends projecting above the deck well forward, while their breeches are down in the hold. They are to be set at a fixed angle of 16°. The range is to be adjusted by varying the amount of air admitted. The eight inch projectile has reached a destructive range of one mile with about the same elevation. The range will be undoubtedly much greater with the larger projectile. All the details of the loading and discharging mechanism are to be as perfect and automatic as possible. Within the hold are stowed a quantity of heavy tubes to contain the compressed air.

In firing practice, the distance of the mark must be estimated and the discharge valve set accordingly. The vessel is then turned until the gun points to the mark, when the projectile is discharged. Should the vessel be rolling, the discharge must take place when she is on an even keel, the artillerist waiting his time. The pitching will tend to alter the range, but owing to the high trajectory the effect will be far less than in ordinary gun practice. An inclination of over 4°, due to pitching, is not looked for in any ordinary sea.

A gun of about the same size has been constructed for the Italian government, ultimately to be erected at Spezia. This piece is now the subject of experimentation at Fort Lafayette, New York harbor, in the charge of Lieut. Zalinski, and will show what is to be expected from the armament of the new ship.

The Vesuvius is built of steel. She is 246 feet long, 26½ feet wide, with 8½ feet mean draught. Thus she is sixteen feet longer than the Yorktown, and only a little over two-thirds her width. She is of 700 tons measurement. These dimensions, as well as the elegance of her model, indicate high speed, and her machinery is built to attain the same end. She is to have twin screws. The machinery comprises two vertical engines, each with four cylinders arranged for triple expansion. Of the cylinders belonging to each engine, one is 21½ inches, one 31 inches, and two 34 inches diameter. The stroke is 20 inches. The engines are not yet complete, but a good idea of what they will be is afforded by the cut. The four cranks are disposed at angles of 90° with each other. They are similar as regards valve gear to those of the Yorktown. The contract calls for 3,500 indicated horse power, but 4,000 is confidently expected. A speed of 20 knots per hour, equal to about 23 statute miles, is to be attained. Her shafts, of Whitworth fluid compressed steel, are hollow and of 8 inches diameter.

The vessel's sides are smooth plated with ¼ in. steel, butt jointed, fastened by interior straps over the juncture lines. The joints are made as perfect as possible, and are calked outside with a flat faced tool. The thinness of the sheets made it extremely difficult to give her a smooth skin, and the work must be regarded as singularly successful.

When all the machinery is in place, the Vesuvius will float low in the water, and if by her two screws she keeps bow on to her adversary, will present a very small target, and at the same time be able to discharge her torpedoes.

Much other work of interest is in progress at the yard. Two of the new U. S. cruisers are being built, and a twin screw passenger steamer for the Central R. R. of New Jersey is nearly ready for launching. She is to run between New York and Sandy Hook, and will be the largest vessel of her style in the waters about New York. She is 250 feet long, 35 feet wide, and 10 feet draught, and is to have 2,500 indicated horse power.

For the new Long Island Sound steamer Connecticut, of the Stonington line, engines and boilers are in process of construction. They are of a new type for this class of boat; being diagonal oscillating compound engines. The two cylinders are 56 inches and 104 inches diameter, with eleven feet stroke. The boilers for this gigantic machine are to be 12½ feet diameter and 19½ feet long. A development of 5,000 indicated horse power is to be attained. The steamer is now approaching completion, and lies at the foot of 8th Street, on the East River, New York.

* See SCIENTIFIC AMERICAN, Vol. 57, No. 14.

Changes of Level in the Coast of England.

Ciel et Terre states that attention was long ago directed to the changes of level that the southern coast of Great Britain is undergoing; but that unfortunately the movements are so complicated that the study of them is not much more advanced than it was when they were first observed, when an attempt was made to explain them by a variation in the level of the sea. Mr. Gardner, in a recent number of the *Geological Magazine*, expresses the opinion that the entire coast is in motion.

In many places there are found remains of forests buried 65 feet below the level of the water. At Penzance human bones have been collected at a depth of 40 feet beneath the limit of high tide, and at Carnan at a depth of 65 feet. The Isle of Wight has separated from English soil only since the beginning of the Christian era. But it is in Cornwall especially that the sea has encroached upon terra firma. The city of Poole, for example, is built upon a spot where, seventy years ago, the water was very deep. The dunes near this city, on the contrary, were in forty-four years (between 1785 and 1829) encroached upon by the sea to the extent of nearly a thousand feet. The county of Kent seems to be rising, and that of Sussex to be rising on one side and subsiding on the other, while the counties more to the west are settling.

A Meteor.

Dr. G. O. Williams, of Greene, Chenango Co., writes: "I witnessed last evening, April 21, at 7:30, a large meteor. It appeared in N.N.W. Elevation, 30. 0. Direction, east. Course, curved. Observed length of path, 20. 0. Terminated by separation into three or four fragments, nearly due north. Elevation, 15. 0. Heard no report. Duration, two seconds. Others may have observed the same."

Correspondence.

Improved Lamps Needed.

To the Editor of the Scientific American:

Notwithstanding all that has been said and written about the danger of oil lamps, it is stated, on reliable authority, that we have in the United States a daily average of three hundred accidents, entailing serious loss to life and property.

The rapid spread of flames by the explosion or breaking of a lamp is well known, but it is not generally known that the gas which occasions such disasters is formed in the brass receptacle which holds the wick, and not in the tank (as is commonly supposed) which contains the oil. The multitude of devices for preventing lamp explosions go a great way to show that the subject has been very imperfectly investigated.

The crowning defect of the ordinary kerosene lamp could not be more forcibly illustrated than by comparing the wick holder to a miniature gas machine, generating gas and depositing it in the oil tank. This comparison may be more readily seen when it is considered that the wick holder referred to has a flame of intense heat burning at the end of it.

If inventors could diminish the danger attending the present use of kerosene oil, by some improved method, they would doubtless be deserving of public gratitude and compensation. W. H.

To the Editor of the Scientific American:

I have constructed an electric motor by the description as published by you in the SCIENTIFIC AMERICAN of recent date. I followed the directions carefully except in the use of a cast iron field magnet and base all in one piece.

The machine runs beautifully and develops considerable power. In testing it I placed it in a shunt of a 2,000 candle arc lamp of the Thomson-Houston system, with a wad of paper between the ends of the lamp carbons. In this way the motor made about 1,000 revolutions per minute, and runs very steady. On allowing the carbons to touch each other, the motor immediately starts off at a most terrific rate of speed, which we were unable to measure with a speed indicator, but think it must have been at least 10,000 per minute. At first I was afraid the coils would heat in a circuit of 4 or 5 amperes, or that the centrifugal force would spread the coils on the armature, but no harm was done. A continuous run of an hour did not heat the coils or bearings (brass) in the least, and I am much pleased with the machine. I propose to put up eight 1 gal. cells of 18 or 20 electric light carbons in each, with 3 zincs, 2½ by 9 inches, to each porous cup, and connect in series, to run the motor. I propose also to construct another armature to fit the same field magnets, but wind to the same diameter with much smaller wire, say 24 or 30, and use the machine as a dynamo, the field being the same as now (No. 16 wire).

THOS. C. HARRIS.

Raleigh, N. C.

A Cingalese Rock Fortress.

For the first time for a number of years, the Sigiri Rock, in Ceylon, has been scaled by a European, the feat on this occasion being performed by General Lennox, who commands the troops in the island. It is said, indeed, that only one European, Mr. Creasy, ever succeeded in reaching the summit. The rock is cylindrical in shape, and the bulging sides render the ascent very difficult and dangerous. There are galleries all round, a groove about 4 inches deep being cut in the solid rock. This rises spirally, and in it are fixed the foundation bricks, which support a platform about 6 feet broad, with a chunam-coated wall about 9 feet high. The whole structure follows the curves and contours of the solid rock, and is cunningly constructed so as to make the most of any natural support the formation can afford. In some places the gallery has fallen completely away, but it still exhibits flights of fine marble steps. High up on the rock are several figures of Buddha, but it is a mystery how the artist got there, or how, being there, he was able to carry on his work. The fortifications consist of platforms, one above the other, supported by massive retaining walls, each commanding the other. Owing to the falling away of the gallery, the ascent in parts had to be made up a perpendicular face of the cliff, and General Lennox and four natives were left to do the latter part of the ascent alone. The top they found to be a plateau about an acre in extent, in which were two square tanks with sides 30 yards and 15 feet respectively in length, cut out of the solid rock. A palace is believed to have existed on the summit at one time, although time, weather, and the jungle have obliterated all traces of it. During the descent the first comer had to guide the foot of the next into a safe fissure, but all reached the bottom safely after two and a half hours. It is said that the amount of work expended on the galleries is incredible, and the writer of the account of the feat doubts if all the machinery of modern times could accomplish the stupendous work that was achieved here in old days by manual labor alone.

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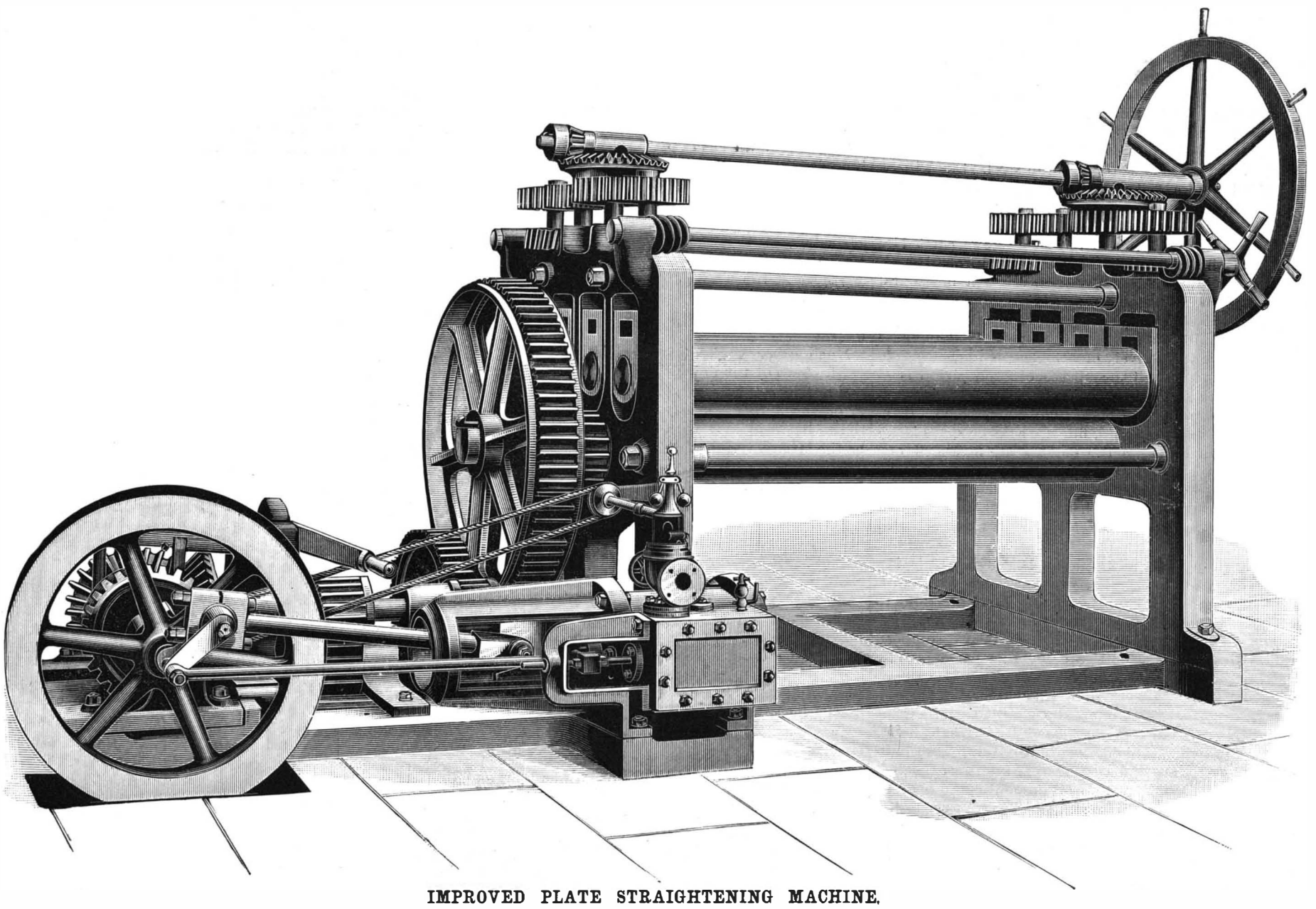
Water Power for Milling.

The *Post-Dispatch*, of St. Louis, published in a recent number the following account of an interview between one of its reporters and Mr. Allan T. Gale, a Minneapolis miller. Mr. Gale was apparently apprehensive regarding the prospects of Minneapolis as a center of flour milling, as he said: "We Minneapolis millers have for years been very anxious concerning the water supply. Year by year the amount of water coming over the Falls of St. Anthony has been diminishing, and this winter the trouble has been more serious than ever before at this season. The ice has always interfered with the operations of the mills, but this year the trouble has been the lack of water, and all mills without subsidiary steam power have either suspended operations or run at half power. Of the eighteen great mills, nine have substituted steam for water, while it is evidently a question of a very few years when all must do so. The decrease in the volume of water, caused by the diminution of the rainfall, generally ascribed to the cutting away of the timber, is not the only or indeed the most threatening danger that impends over the water power of Minneapolis, and bids fair to depose our city from its present position as the great flour-producing point of the world. The rock over which the river runs about the falls is of a very soft and porous nature, and in spite of all that can be done is fast wearing away. The falls have been cased in boards, regular inspectors are continually on watch, and every precaution has been taken to check at once any tendency of the rock to break down. But in spite of all this, the danger of the river tunneling through the soft rock is always present, and it would surprise no one to find some morning that the Minneapolis water power had entirely disappeared. Some eight years ago the water began to penetrate the rock on the east side, and it was by a mere chance that the falls were saved. The likelihood of their disappearance increases every year, as the stratum of hard rock which incases the very soft underlying limestone is in places almost washed through, and the limestone itself will melt before the rush of the rapids almost as easily as clay. Minneapolis was made by the falls, and should they fail, her prominence will disappear.

"The millers, recognizing the impending danger," Mr. Gale went on to say, "are looking about for new locations. Two places present themselves to the consideration of the flour men—the Red River of the North country and St. Louis. Before the rise of Minneapolis, St. Louis was the greatest flour point in the United States, and to-day this city ranks second. Many of our most far-sighted flour men have been quietly surveying the ground here, and before long the city will be surprised by the number of new mills that will be erected. The region along the Red River of the North is excellent for wheat, in spite of the low temperature of winter, and the river itself furnishes ample water power for all the mills in the world, being one series of swift rapids. Many of our most enterprising men have thoroughly prospected this field, and last winter many contracts for land suitable for mill sites were closed. Of course the millers, and the citizens of Minneapolis in general, are inclined to laugh at the danger which threatens that city, but they are fully alive to its seriousness and imminence, and many of those now most vociferous in their declarations of the future greatness of the city have quietly made preparations to move elsewhere."

IMPROVED PLATE STRAIGHTENING MACHINE.

We illustrate below a plate straightening machine, by Francis Berry & Sons, of the Calderdale Iron Works, Yorkshire. For our engraving we are indebted to *Engineering*. This machine, which is capable of dealing with plates up to nine-sixteenths inch thick by six feet wide, has seven rollers, four of which are adjustable, and can be raised or lowered either all together or the two outer ones can be adjusted independently of the remainder. Power is supplied by cast steel pinions keyed on the ends of the three remaining rollers, and the driving gear generally, which includes an engine having a cylinder ten inches in diameter, regulated by a high speed governor, is confined to one end of the machine, while the hand wheel for adjusting the rollers is placed at the other. In this way the workman in charge runs no risk of being caught in the gearing. As will be seen from the illustration, the machine is mounted on a strong cast iron bed plate, extending its whole length, so that, in spite of its weight being 12¼ tons, but little foundations are required, and the machine is completely self-contained.



IMPROVED PLATE STRAIGHTENING MACHINE.

The New Artesian Well at Paris.

The artesian well of Place Hebert, at Paris, has just been finished, after twenty-two years' work on it. It was necessary to bore to a depth of 2,360 feet to reach water, and such depth was attained only with the greatest difficulty. The work had to be stopped several times, either on account of the hardness of the strata traversed or of the crushing of the metallic tubing, caused by the pressure of the earth. The new well is the third of the public wells of Paris, the others being those of Grenelle and Passy. Its diameter is 5¼ feet, and the weight of the tubing about 880,000 pounds. The temperature of the water that it furnishes is 34½°. The cost of this important undertaking was $500,000.

Uses of Mica.

The peculiar physical characteristics of mica, its resistance to heat, transparency, capacity of flexure, and high electric resistance, adapt it, says *Engineering*, to applications for which there does not appear to be any perfect substitute. Its use in windows, in the peep holes on the furnaces used in metallurgical processes, as well as the ordinary use in stoves for domestic purposes, are examples of its adaptability to specific purposes which it does not seem to share with any other material. Recently there has been introduced in America a type of watch in which the plate covers about three-fourths of the works, and the remaining portion over the balance wheel and attendant mechanism is protected from exposure when the watch is open by a thin covering of mica. The inclosure of the mechanism of the watch is rendered still more perfect by a ring which is placed around the works before they are inserted into the case. Its fitness for use in physical apparatus is represented by its application for the vanes on the Coulomb meter recently invented by Professor George Forbes, F.R.S. For electrical purposes mica has proved useful, acting as an insulator between the segments of commutators of dynamos and safety fuses in lighting circuits, also as the base part of switches handling heavy currents, to obviate the danger of ignition by the arc formed when the switch is changed. For this latter purpose it shares the field with sheets of slate. Both of these uses were first suggested a number of years ago by an insurance expert in America, in the course of regulations governing the safe installation of electric light plants. As a lubricator mica answers a very peculiar purpose for classes of heavy bearings, where the powdered mica serves a useful office in keeping the surfaces separate, thereby permitting the free ingress of oil. It is used in roof covering mixtures in a powdered condition in combination with coal tar, ground steatite, and other materials, its foliated structure tending to bond the material together. Not affected by ordinary chemicals which are corrosive to many other substances, it has been applied in the valves to sensitive automatic sprinklers, where a sheet of mica placed over a leather disk has proved to be non-corrosive, and without possibility of adhering to the seat, while the leather packing rendered the whole sufficiently elastic to provide a tight joint.

PROF. LECLERC, writing in *Cosmos*, maintains that odors are due, not to the emanations, *as such*, of so-called odoriferous bodies, but to the vibratory movement among such emanations, due to processes of oxidation. Scent, on this theory, is analogous to sound.

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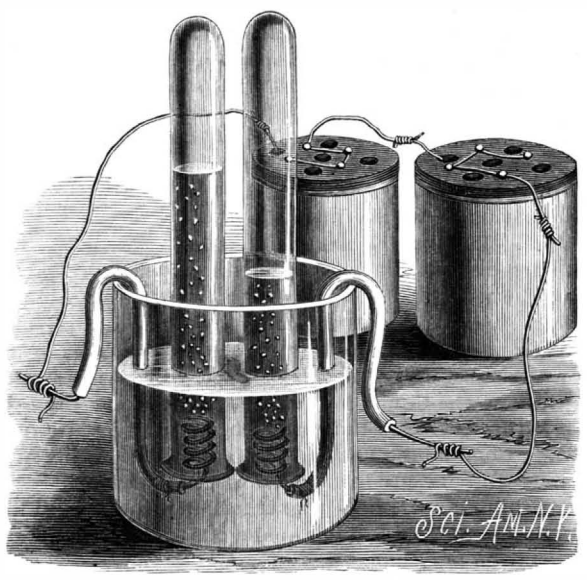
THE DECOMPOSITION OF WATER AND ABSORPTION OF CARBON DIOXIDE BY CAUSTIC SODA.

T. O'CONOR SLOANE, PH.D.

The apparatus generally used to illustrate the decomposition of water by the electric current consists essentially of two plates of platinum immersed in a vessel containing water acidulated with sulphuric acid. The object of the acid is to impart sufficient conductivity to the water, and platinum electrodes are used because they are not attacked by sulphuric acid. There are several objections to the use of this apparatus for general demonstrations. It is somewhat expensive, the platinum plates are extremely fragile, and are not easily connected with the wires from the battery. In the apparatus illustrated iron wire is used in place of platinum electrodes, and a solution of caustic soda is the electrolyte.



DECOMPOSITION OF WATER.

The two pieces of wire, which may be one-sixteenth to one-eighth inch in thickness, have one end bent into a spiral of about one-half inch external diameter. Over the rest of the wire a piece of India-rubber tubing is slipped, of such length as to leave about an inch exposed. At the end nearest the spiral the tube is tightly wrapped with a few turns of fine wire or even string, which is then secured. The electrodes are then bent as shown and hung over the edge of a suitable vessel. A couple of test tubes may be used to catch the gases evolved.

As caustic soda solution is an unpleasant substance when it comes in contact with the hands, the apparatus is best set up in the following manner: The cup is filled with water, and the electrodes are put in place. The test tubes are then filled, one at a time, also with water, and inverted over the electrodes in the usual way, their ends being closed by the experimenter's thumb. Next some of the water is removed by careful pouring, so as to leave the vessel but one-half full. Some strong solution of caustic soda is now poured into the vessel, and stirred or mixed with the water as well as possible. If the terminals of an active battery of sufficient voltage are now attached to the electrodes as shown, the water will be rapidly decomposed, and the hydrogen and oxygen gases evolved will rapidly collect in the tubes. In simplicity and cheapness this apparatus cannot well be surpassed, and on account of the very large surface of the electrodes its resistance is low, and the water is decomposed with very great rapidity. For purposes of demonstration it may be pronounced superior, all things considered, to the usual form with platinum electrodes passing through the glass.

A very interesting experiment illustrating the absorption of carbonic acid gas or carbon dioxide by a caustic alkali, and one that is susceptible of various modifications, is next illustrated. A strong bottle or a round bottom flask fitted with a tight perforated cork is required. A glass tube is arranged to pass tightly through the aperture in the cork, and a common India-rubber balloon is tied to the tube, the lower end of the latter passing within its neck. The tube now is in communication with the interior of the balloon. If one were to blow into the tube, the balloon would become inflated. A strong solution of caustic soda or potash is made, and when perfectly cold is poured into the flask. Some water is now poured very slowly and carefully down the side of the vessel, so as to collect upon and float over the heavy solution of alkali. This it will do in virtue of its lower specific gravity. The separation of the two fluids is evident on inspection. If, however, the experimenter is unwilling to risk this separation, he may use kerosene oil in place of water. The latter will inevitably float on the caustic alkali. The point to be attained is to have the solution covered with a second liquid which is without action upon carbonic acid gas.

Carbonic acid gas is now evolved in the ordinary way from limestone and hydrochloric acid, or by any other method, and is conducted into the flask. Great care must be taken not to disturb the two layers of liquids in the manipulations.

When the flask is full, the conducting tube is lifted out, and the cork with empty balloon attached is placed in the neck as shown. The cork must fit accurately. Now the flask is shaken. The caustic alkali solution at once comes in contact with the carbonic acid gas and absorbs it. In an instant the absorption is complete, and under the influence of atmospheric pressure the balloon inflates and either fills the vessel or bursts.

It is not necessary to use a flask. Any transparent bottle may be used. It is necessary to have the alkaline solution cold before introduction, as otherwise it may crack the flask.

In general terms a chemical vacuum is thus produced, and it may be demonstrated by the height of a mercury column which it can support, or in many other ways.

The particular one described is particularly well adapted for demonstration, as it is very simple and demonstrative. The balloon should be so large that it will not burst, as the effect is better when it inflates and fills the vessel lying closely against its sides.

VIROT'S STEAM CARRIAGE.

The solution of no problem is more sought for than that of the mechanical traction of small vehicles on ordinary roads. Since the first reaction steam carriage, based upon the principle of the eolopyle, and proposed by Isaac Newton, in 1680, and the first steam carriage, constructed in 1769 by Nicolas Joseph Cugnot, and of which a second and improved model, constructed in 1770, still figures in the gallery of the Conservatoire des Arts et Metiers, at Paris, numerous experiments have been made with a view to the application of mechanical traction to ordinary carriages. The solutions proposed or experimented upon may be classed in two distinct groups. One of these includes apparatus in which the energy is produced by thermic generators, in measure as needed, by converting heat into work. This group includes steam apparatus in which the fuel is coal, coke or petroleum, and certain newer apparatus in which the heat of combustion is utilized directly without passing through the intermedium of the steam boiler. In a recent patent, Mr. Debriat even proposes, under the odd name of the "imponderable dynamophore," a powerful and light powder motor in which the explosion is produced by an electric spark!

The second group belongs to the class of reservoirs or accumulators, a system in which a supply of energy, known and prepared in advance, is carried under the form of compressed air, hot water, taut springs, or electric accumulators.

Compressed air, and, *a fortiori*, springs, constitute poor reservoirs of energy, as regards specific power, but the future seems open to electric accumulators, which have not yet had their last say.

Our preferences are for a powerful and light accumulator completed by a pile of great capacity, but of feeble discharge, that will keep the accumulator constantly charged, even during periods of rest. Two qualities, power and duration, which are not met with in combination in any known apparatus, would thus be united.

VIROT'S STEAM CARRIAGE.

Whatever be the solutions of the problem in the future, those of the present are oftenest made in view of the utilization of thermic motors, under the form of a furnace that heats a steam boiler which itself supplies the steam cylinder.

The annexed figure represents one of the most recent types of steam carriages. It was constructed by Mr. Virot, head machinist at the Central School of Lyons.

The carriage is actuated by two motors that drive the hind wheels through the intermedium of gearing. In front there is a steering wheel maneuvered through a hand lever. The boiler is of the Seguin type. Twenty minutes suffice to put it under pressure. The speed of the carriage is 9½ miles per hour, and it is capable of ascending gradients of 1 to 13 without difficulty. Behind, there is room for three persons, inclusive of the engineer. It is capable of hauling a load of 2,640 lb. As for the consumption of fuel, that does not exceed four pounds to the mile. With a tender supplied with water and fuel, the carriage is capable of making lengthy trips.

While we do not think that Mr. Virot's apparatus definitely solves the problem of the traction of small vehicles upon roads, it has seemed to us well to present this tentative to our readers, with the object of encouraging researches and of showing the state of the question.—*La Nature.*

ABSORPTION OF CARBON DIOXIDE.

The Colors of Twilight.

Prof. Constantini Rovelli has recently published, in the *Revue Scientifique Industrielle*, a study upon the colors exhibited at twilight, according to the state of the air.

Red and orange tints predominate when the air is dry. On the contrary, yellow, and especially green, characterizes air charged with vesicular vapor.

Prof. Rovelli studies the colorations of the air and their successive modifications in various cases and in the various parts of the crepuscular region, in measure as the sun disappears from the horizon. He likewise studies the same phenomena at the advent of "aurora with rosy fingers," and from them draws conclusions based upon the theory of the colors of the solar spectrum. Observation has already shown that the warmest colors of the spectrum predominate during a period of fine weather, while a yellow tint, followed by a greenish twilight, is the index of great humidity.

On another hand, we may consider the atmosphere as formed of two strata, the lower of which contains clouds and dust and the upper of which is more transparent. These two strata, as regards their refrangibility and absorption, behave differently in the presence of the rays that traverse them. From this Prof. Rovelli concludes that the crepuscular green is the precursor of rain; and, on the contrary, that a rosy twilight announces fine weather, according to the saying: "Rosso di sera; buon tempo spera." Let us compare with this adage the one current in Provence: "Roudgé dé matin, ploou sü lou vesin," *i. e.*, "red in the morning, rain is approaching."

Chemical Misnomers.

An editorial in the *Popular Science News* recites some of the curiosities of names of chemical compounds, which, when their inappropriateness is considered, appear extremely ludicrous. Thus: Oil of vitriol is no oil, neither are oil of turpentine and kerosene. Copperas is an iron compound, and contains no copper. Salts of lemon is the extremely poisonous oxalic acid. Carbolic acid is not an acid, but a phenol. Cobalt contains none of that metal, but arsenic. Soda water has no trace of soda, nor does sulphuric ether contain any sulphur. Sugar of lead has no sugar, cream of tartar has nothing of cream, nor milk of lime any milk. Oxygen means the acid maker, but hydrogen is the essential element of all acids, and many acids contain no oxygen. German silver contains no silver, and black lead no lead. Mosaic gold is simply a sulphide of tin. This list might readily be extended, both in chemistry and other natural sciences, and it is only fair to state that these terms all come from the older writers, and tend to give way to a more scientific nomenclature.

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The Best Material for Propellers.

At a recent meeting of the Institution of Naval Architects, Mr. W. C. Wallace read a paper on the above subject, in which he gave the following conclusions:

Taking the life of cast iron blades at about six years and steel at four years, a steamer of 5,000 tons having four propeller blades of the joint weight of 12 tons, if of cast iron, an expenditure at the rate of 192*l.* per four years for cast iron and 396*l.* for steel would be required. On the whole, the author leans toward cast iron. Turning to a comparison of steel and bronze, there are three matters claiming attention: 1. The larger coal bill with steel blades. 2. The necessity of renewal of steel on account of pitting and corrosion. And 3. The possibility of having to renew bronze blades on account of failure from no immediate ostensible cause. It has been said that for the same speed 4 per cent difference of power in favor of manganese bronze may be expected. Allowing the same difference to apply to the comparison of steel and the other alloys, in a 5,000 ton ship, with a coal consumption of 50 tons a day, this 4 per cent difference of power means 2 tons of coal a day of a mean value of, say, 2*l.* This in four years amounts to 1,200*l.*, which should be added to the 396*l.*, which is, as stated, the price of steel blades. Therefore, 1,596*l.* is the disbursement in connection with steel blades every four years. The price of gun metal blades for the same steamer would be obtained by multiplying 144 by 12, the weight of cast iron blades. This comes to 1,728*l.* each time the gun metal blades are renewed. If renewal took place at intervals of 4⅛ years, the disbursement for gun metal blades would be identical with the disbursement for steel over the same period. This is neglecting the charge for docking and the cost of zinc.

Making similar calculations for the other alloys, and tabulating the results, it appears that economy in the use of the alloys would be the same as that of steel if on an average one blade had to be renewed every

13 months for gun metal.
11 " " manganese bronze.
14 " " phosphor bronze.
10 " " delta metal.
12½ " " aluminum brass.

It will be seen that the two things which tell against steel are the necessity for the renewal of blades every four years and the extra coal. In strength, mild steel is superior to all other materials, and the author was informed by the Cowles Electric Smelting Company that its strength and soundness can be greatly improved by the addition of mitis or ferro-aluminum. It was also stated that something had been done in improving the strength of wrought iron by the addition of mitis, making it fusible and readily cast.

The discussion on this paper was opened by Admiral Colomb, who stated that he had seen propeller blades scored and pitted on the back surface. These marks generally took a direction radial to the boss.

Mr. Hall, of Messrs. Jessop & Co., of Sheffield, said that the chief objection to steel blades was the corrosion referred to. As a steel maker, he was sorry to be obliged to confess that in this respect steel was worse than cast iron. He wished to refer to what might be a possible cause of this pitting. Some time ago he took out of working four boilers made from hard steel plates which had been in work twenty-four years. Iron rivets had been used, and the plates near the rivet holes were gone. He had thought that the iron rivets abstracted the carbon from the steel, and possibly the same action might take place between the steel propeller blades and the iron stern frames of the ship. For this reason he had suggested cast steel stern frames. But he thought that there might be a further cause for the pitting of propeller blades. The corrosion was mostly found on the idle side of the blade, and it might be that air was drawn down through the water to fill the vacuum formed by the water not being able to follow up the blade sufficiently quickly, and corrosion was thus set up. If this were the case, it would be no good making these blades of softer metal. The author had given 31 to 32 tons steel, but the speaker would go to very far higher tensile strength, and this could be got with about 10 per cent elongation and a good bend. It would not necessarily be carbon that would be used to get the tensile strength, for there were other alloys that could be used with greater advantage for the purpose. The author had said very little about steel alloys, but Mr. Hall was of opinion that an alloy of steel would not corrode when used for propeller blades.

Mr. F. C. Marshall said that if any one could discover a method of producing non-corrodible steel blades he would make a large fortune. The problem had been engaging many minds for a long time past, but the difficulty had not been overcome yet. It was pretty generally accepted that air gets down to the back of the propeller and causes the pitting. As to what Mr. Hall had said, there was no doubt that deterioration more readily takes place in soft than in hard steel. Ship builders have used the soft Lowmoor iron for rivets, and found it gave rise to the trouble from pitting far more than did the commoner and harder brands. He thought it strange that the paper had not made more reference to mitis metal, and thought it would be extensively used in future, for it was wonderful what could be done with it. He would be glad for some information as to the strength of this metal. He was well acquainted with its remarkable ductility.

Mr. G. W. Manuel, superintendent engineer to the Peninsular and Oriental Steam Navigation Company, said that he would give some details from actual practice. In 1880 they had much trouble from ships breaking off the cast iron blades of propellers in going through the Suez Canal, and from the loss through failures in manufacture, and also from corrosion, by means of which the blades became blunted. In order to get out of these difficulties they had recourse to steel, using a very ductile metal supplied by Vickers. Blades made from this would bend when struck, and this settled the breakage problem. But they found the corrosion was greater with steel than iron. In order to meet this difficulty, soft brass plates were put on the surface of the part corroded, being attached by screws. Latterly the plates were let in flush, great care being taken in fitting them. This plan was so far successful that the plates would sometimes last six years, sometimes only three years. The average efficiency was four years. They next made a sheathing of brass to lap over the blade, and thus form a cutting edge. Propellers fitted in this way were still running. On the whole, though, it was concluded that steel was not the right material, and about this time manganese bronze came into the market. They hesitated in adopting this alloy, because they had heard of a good many breakages of blades made from manganese bronze. On inquiry he found that the failures had been in blades not made by the Manganese Bronze and Brass Company, Mr. Parsons, the manager, informing him that none of their metal had given way. It was, therefore, determined to give the metal a trial. The following are some of the results obtained with one of the company's vessels, the Ballarat, on an Australian voyage from England and home again:

	Speed.	Coal per day.	Indicated horsepower	Slip of Screw.
		Tons.		Per cent.
Steel blades	12·11	63·8	2,828	13·1
Bronze	12·35	55·0	2,577	9·7

The diameter, pitch, and surface of the propeller were the same in both cases. The figures are a mean for the whole voyage, and show an increase of 0·24 knot per hour, and a saving of 8·8 tons per day in favor of the bronze blades, or a total saving on the voyage of 715 tons. The displacements and weather were alike on each occasion. The company then determined to fit manganese bronze blades to one of two ships then building, the Victoria and Britannia. The following is a comparison of the trial trip results:

Ship.	Material of propeller.	Steam.	Revolutions.	Indicated horse power.	Speed.	Displacement.	Slip.
							p. c.
Victoria	Manganese bronze	146	63	6,084	16·52	8,124	8
Britannia	Steel	146	64	6,203	16·47	8,040	10

The propellers of both vessels were alike as regards diameter, pitch, and surface. The results of the various trials were to impress the speaker with the fact that manganese bronze propellers were more effective than those of steel. He thought one great advantage with manganese bronze was the thinner edge that could be got. He did not place so much value upon thinness in the central part, as when their cast iron blades broke they thickened them two inches, and got the same speed with the same power.

Natural History Notes.

Reproduction of Parts of Plants.—Prof. F. W. C. Areschony explains, in the *Botanisches Centralblatt*, the tendency of some parts of plants to produce leaf buds and stems, and of others to produce roots, or, of the same parts, sometimes to produce leaf buds, at other times roots, by the hypothesis that leaf buds are produced by those parts where there is a larger accumulation of nutrient material, roots by those parts where the supply is smaller, stems requiring a larger amount of nutriment than roots in consequence of their larger size and greater complexity of structure. This is illustrated by the well known fact that in trees the strongest branches always spring, not from the lower, but from the upper part of the previous year's shoot, where there is a larger supply of nutriment. Again, leaves in which the supply of food material is limited can, as a rule, produce adventitious roots only; but occasionally leaf buds on their basal portion.

Effect of Violet Rays on the Development of Flowers.—Prof. Sachs, the celebrated German botanist, has discovered that the ultra-violet and invisible rays of the solar spectrum especially promote the development of flowers, the growth of which is exceedingly feeble when the rays are suppressed, although that of the other parts of the plant is very luxuriant.

Sieve Tubes.—In a paper on the obliteration of sieve tubes in the *Laminariæ*, published in the *Annals of Botany*, Mr. F. W. Oliver gives it as his opinion that the callus or thickening of the sieve plates in plants is formed, as suggested by Wilhelm and Janczewski, by an alteration of the cell wall, and not from the contents of the cell. Although in the foreign genera *Macrocystis* and *Nereocystis* true sieve tubes very like those of *Cucurbita* are met with, yet in the majority of the *Laminariæ* sieve tubes are represented only by narrow tubes known as trumpet-shaped hyphæ, in which the callus extends up the sides of the cell wall and is not restricted to a thin plate-like form. Mr. Oliver has been fortunate enough to meet with an instance in which the mode of formation of the callus is shown in different stages of development, the walls of the tubes presenting callous degeneration at intervals. The callus of *Laminaria* was found to agree with that of flowering plants in its micro-chemical reactions, and may be regarded as chemically the same substance.

Milk and Butter Trees.—The rich and little known vegetation of Upper Senegal and Upper Niger includes curious forest specimens whose fruit or sap furnish men with food products analogous to milk and butter. In the first place, we may mention a sort of oak called the *karité*. This tree bears fruit somewhat like that of the horse chestnut tree, and having a white and compact flesh. These nuts, dried in a furnace and then decorticated, are crushed and powdered, and the resulting pasty flour is put into cold water. This forms a white substance of buttery aspect, which rises to the surface of the liquid, and which, beaten and pressed, constitutes a sort of butter which the natives use as a food. Commander Gallieni, who has studied this substance and its production *in situ*, considers it very nourishing, and thinks that it might also be used for making soaps and candles analogous to those manufactured from paraffine.

In Venezuela, the *karité* has a vegetable competitor in a tree of another species, the *tubayba*. In this case, it is the abundant lacteous sap of the tree that is utilized. This is collected by the natives by simply making an incision in the bark. According to explorers, the milk of this tree is fatty, has an agreeable odor, and is nutritive. Perhaps the most remarkable of these milk trees is found in the forests of British Guyana. The pith and bark of this tree contain so large a quantity of sap that the least incision made in the surface causes the valuable liquid to flow. The natives hold it in high esteem as a food. This product, called *hya-hya*, not only resembles milk in appearance, but also in unctuousness and taste.

The Smallest Plant in the World.—The smallest flowering plant in existence is *Wolffia microscopica*, a native of India. It belongs to the natural order Lemnaceæ, or the duckweed family. It is almost microscopic in size, destitute of proper stem, leaves and roots, but having these organs merged in one, forming a frond. There is, however, a prolongation of the lower surface into a kind of rhizoid, the purpose of which seems to be to enable the plant to float upright in the water. The fronds multiply asexually by sending out other fronds from a basilar slit, or concavity, and with such rapidity does this take place that a few days often suffices to produce from a few individuals enough similar ones to cover many square rods of pond surface with the minute green granules.

But small as these plants are, and simple in their structure, they yet produce flowers. Two flowers are produced on a plant, each of them very simple, one consisting of a single stamen, and the other of a single pistil, both of which burst through the upper surface of the frond. There are two species of this genus growing in the Eastern United States, one of them, *Wolffia Columbiana*, about 1-25 of an inch in diameter, and the other, *W. Brasiliensis*, somewhat smaller in size. The American species has been collected near Philadelphia.

Subterranean Fishes.—In the Algerian Sahara there are numerous subterranean lakes in which a number of small fish and mollusks live and multiply. Moreover, the artesian wells of the Sahara often throw out fish that are sometimes two inches in length. The governor of the oases of Thebes and Garbes, in Egypt, in 1849, asserted that he took from an artesian well 440 feet deep, near his residence, fish in sufficient quantity to supply his table.

Fauna of the Tomb.—Concerning this subject, Mr. P. Megin said at the meeting of November 14 of the French Academy of Sciences: "It is generally believed that the buried cadaver is devoured by worms as in the free air, and that such worms grow spontaneously. We know, however, that these so-called worms are the larvæ of insects which arise from eggs deposited upon the cadavers. They consist of diptera, coleoptera, lepidoptera, and arachnidæ, and we find that the time chosen by these organisms for the depositing of their eggs varies in accordance with the degree of decomposition undergone by the cadaver. The time varies from a few minutes to two or even three years after death; but the period of appearance is so regular and constant for each species that we may, by an examination of the debris which they leave, decide upon the age of the cadavers, that is to say, ascertain with accuracy the time of death.

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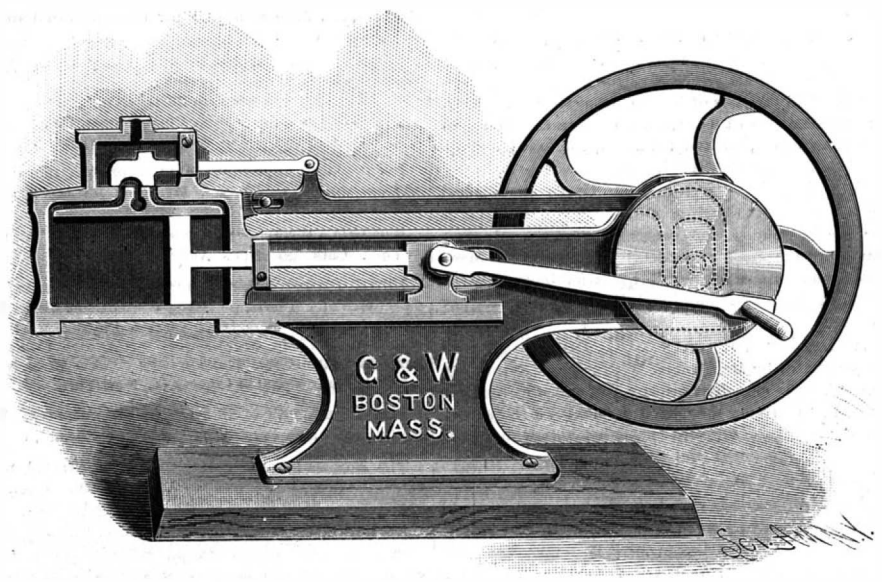
SECTIONAL MODEL OF STEAM ENGINE.

Steam as a motive power has become such a necessity to civilized life and such an everyday sight in our midst, that those who understand the internal construction of a steam engine are sometimes rather surprised to find among old and young alike such general ignorance of how the power of steam is utilized to drive our machinery, and also find it not an easy matter to explain, so that those who seek information can understand, the mechanical device which makes the steam engine a success and power among us.

The thoughtful child seeing a train of cars asks: What makes those cars go? and is answered steam; but the child understands no better than before, and the one who answered, perhaps, knows no better than the child.

The professor knows and goes farther, telling his pupils the why and wherefore, describing the movements of the piston and slide valve by aid of diagrams, but as a diagram has to be made for each position of the valve and piston, the seeker after knowledge gets confused, and when he tries to himself explain, finds how little he understood it.

To all who lack the knowledge of how the power of steam is applied, and to all who have occasion to describe to others the internal movements and construction of the cylinder and steam chest, the device here illustrated, and which is just being manufactured and sold by Messrs. Goodnow & Wightman, of 176 Washington Street, Boston, Mass., will prove an article for which they have long felt the want.



SECTIONAL MODEL OF STEAM ENGINE.

The dimensions are as follows: Cylinder 1 in. bore, 2 in. stroke, balance wheel 4½ in. diameter, length of engine over all 10 in. The cylinder and steam chest represent the two with the side toward you removed, the rest of the engine being as usual, and the movements shown by turning the small handle, which is a projection from the crank pin, turning slowly, watching and explaining the movements of the steam on the piston and through the slide valve, as you do so.

As the handle is slowly turned, the wheel revolves. The piston and slide valve perform their movements, and there is combined in our model explanation, diagrams, and convincing evidence of what the steam does when it enters the cylinder, and where and how it goes when leaves it. There has certainly been no device gotten up for a long time which so meets the wants of teachers and schools and of young mechanics.

PREPARATION OF BUTTERFLIES FOR THE CABINET.

On returning from his field excursion, the entomologist will do well, if he has the time, and is not prevented by fatigue, to prepare his captives at once before the rigidity of death sets in. He will do well not to defer this operation (especially if the temperature is very high), and to spread the butterflies while still fresh. It is necessary, too, to kill the survivors, which will struggle when pinned in the box, and finally become injured in their unrestrained movements.

I omit such barbarous processes as sticking a long needle heated red hot (Fig. 1), or covered with tobacco juice, into the body of the insects, and recommend the only practical means that is not repugnant. This consists in the use of a large jar or glass vessel, closed with a wide cork stopper, and having some cyanide of potassium lying on the bottom. The insects are pinned to the under side of the cork and soon die of asphyxia. It will be well not to allow the butterflies to remain in the vessel too long, as the vapors of the cyanide would render them brittle and corrode the pins.

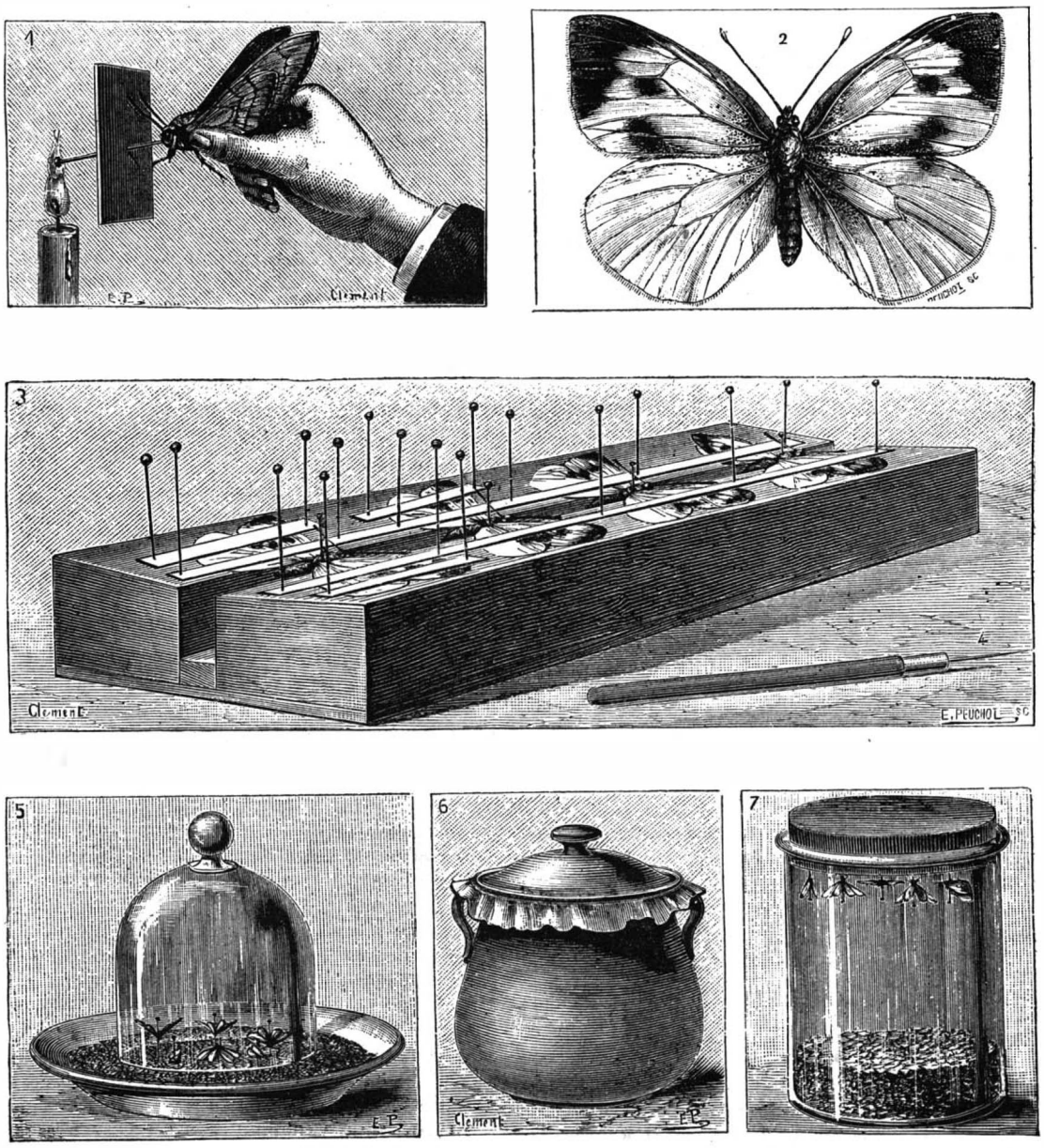
Spreading the wings is an operation designed to give the specimens the final attitude that they are to have in the collection, and that somewhat recalls that of flight, in which the wings are extended horizontally and permit of the four being seen in their entirety (Fig. 2). The apparatus for this purpose consists essentially of a block of soft and light wood having a shallow groove in the center. This groove, which varies in width according to circumstances, and is three-fourths inch in depth, is provided at the bottom with a strip of cork or elder pith, and is designed to receive the body of the butterfly. On each side of the groove the wood slopes very slightly upward. The wood should be carefully pounced, smoothed, and even polished, with Bricançon stone, in order to prevent the delicate wings of the insect from being scratched (Fig. 3).

In order to spread a butterfly it is pinned to the center of the groove, care being taken to have the pin exactly perpendicular. Then a strip of paper is attached by its anterior extremity, with enamel-headed pins, in such a way as not to prevent the upper wing from rising as high as necessary. This wing is moved by pressing it gently beneath the principal vein with the point of a needle inserted in a wooden handle (Fig. 4); and, in order that the wing may not get out of place, the paper band is pressed with the forefinger of the left hand. The lower wing is next extended and held in position by pressing in the same way upon the posterior end of the paper, which is fastened down with a second pin. The same operation is performed upon the two wings of the opposite side.

This is a delicate operation to perform, and requires some practice. It often happens, too, that the specimens are no longer flexible enough to undergo it, and in this case their rigidity only increases. In order to restore their former flexibility, it is necessary to cause them to undergo a special operation, that of softening, which permits of rendering insects that have been dried for a long time as fresh and flexible as living ones. There is nothing complicated about this operation, and the apparatus itself is simple. A concave dish filled with wet sandy loam, and covered with a bell glass fitted hermetically to its rim (Fig. 5); or, for want of this, a well closed pot (Fig. 6), or any other wide and shallow vessel. Such is the apparatus. If it is desired to soften a butterfly, the latter is pinned to the loam, care being taken to prevent the body from touching the latter, and the insect is left to itself in the damp vessel. From time to time a little carbolic acid should be sprinkled upon the loam to prevent the formation of mould. One or two days suffice to restore flexibility to species of medium size, but a little longer time is necessary for large butterflies, especially if they have been dry for some years. Berce, a distinguished lepidopterist, having observed that certain butterflies of a delicate blue or bright green lost their fresh color in damp vapors, several years ago pointed out a method of softening such insects without any danger of destroying their colors. It consists in spreading some cherry-laurel leaves, that have been chopped up fine, over the bottom of a glass or earthen jar (Fig. 7), to a depth of about an inch, and closing the vessel hermetically with a cork stopper. Before inserting the latter, the butterflies to be softened or preserved fresh are pinned to the under side of it.

In this way all species of butterflies can be softened and be preserved for a length of time varying, according to our experience, from fifteen to twenty days. The only precautions to be taken are the following: The cherry-laurel leaves selected must be very mature, and, if damp, must be wiped dry; the jar must be kept cool and in a dark place, and must be often examined, and if any trace of dampness is observed, must be uncorked and dried; and the leaves must be renewed when it is observed that they are turning yellow or that they show any signs of mouldiness. This process is an excellent one, and in nowise alters the most delicate colors. We especially recommend it in every case where it can be applied.

After the butterflies are perfectly dry, they are removed from the setting block. We would offer the following advice: The insects should be allowed to dry for a long time in an inclosed place, in darkness, and be protected from dampness. To leave them in the open air is not prudent, for there are always numerous destructive insects around to lay their eggs on specimens thus exposed. The best thing to do is to keep the setting blocks in a closet or in very tight drawers, and to examine them frequently.—*M. Maindron, in La Nature.*



1. Method of killing a butterfly. 2. Butterfly spread out. 3 and 4. Setting block and spreading needle. 5, 6, and 7. Apparatus for softening butterflies.

PREPARATION OF BUTTERFLIES FOR THE CABINET.

A TRAVELER in Norway says that the horses in that country have a very sensible way of taking their food, which perhaps might be beneficially followed here. They have a bucket of water put down beside their allowance of hay. It is interesting to see with what relish they take a sip of the one and a mouthful of the other alternately, sometimes only moistening their mouths, as a rational being would do while eating a dinner of such dry food. A broken-winded horse is scarcely ever seen in Norway, and the question is if the mode of feeding has not something to do with the preservation of the animal's respiratory organs.

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ENGINEERING INVENTIONS.

A valve gear has been patented by Mr. James Des Brisay, of Kamloops, British Columbia, Canada. It is so constructed that one, two, or more cylinders of a steam engine may be controlled by a single rotating valve, being especially adapted for locomotive engines, while it may also be employed on nearly all classes of steam engines.

The heating of railway cars forms the subject of a patent issued to Mr. William M. Scott, of Cambridge, Vt. It is designed to use the exhaust steam from the locomotive, the invention covering a simple and inexpensive system and apparatus, in which there will be no danger of firing the cars in case of accident, and the apparatus can be easily controlled by the engineer.

An automatic switch and frog for railroads has been patented by Messrs. Lawrence W. Cromer and George Gavin, of Eureka, Nevada. The invention covers a novel construction, whereby it is designed that the engine and cars may be switched through the contact of the wheel flanges with the frog, and whereby the engineer may switch the train directly from the engine.

A car coupling has been patented by Mr. Bush F. Laird, of Ocean Springs, Miss. The drawhead has a link mortise, upper and lower pin openings, and lateral holes for bolts or pins which form pivots for pin-supporting devices, an anchor being so connected with the pin that it may fall in either of two opposite directions, and will properly engage the bearing in either case, with various other novel features.

AGRICULTURAL INVENTION.

A fender for cultivators has been patented by Mr. John W. Kennedy, of Miltonvale, Kansas. It is applicable to both single and double plow cultivators, and consists of a flat blade rounded at its lower front corner, curved outward along its upper longitudinal edge, and with an apertured strap curved between its ends to fit the curve, being designed more particularly for use on growing check-rowed and listed corn.

MISCELLANEOUS INVENTIONS.

A curry comb has been patented by Mr. Frank S. Neal, of Plainfield, N. J. This invention covers a light yet durable construction of a comb, which may be readily cleaned of dust without striking the comb against another object.

A hat wire has been patented by Mr. Alanson Cary, of New York City. It is of triangular shape in cross section, combining increased lightness with strength, for use in the brims of hats, to stiffen and hold them in shape, its form being designed to better adapt it for this purpose.

A metallic shingle has been patented by Mr. Edgar E. Barker, of Junction City, Kansas. This invention covers a novel form of roofing plate designed to be fitted and nailed to the sheathing, so as to interlock and form a water-tight roof, without soldering or crimping of seams.

A drag saw has been patented by Mr. Robert Doak, of Sidney, Ohio. It has an axle or shaft on wheels supporting one end of a frame section, a slotted section beam forming a guide for the saw blade, with handle levers and pitmen, being adapted for sawing logs or sawing horizontally.

A yoke for connecting animals has been patented by Mr. William Carmichael, of Baird, Texas. It is so made as to admit of automatic disconnection in case either of the animals gets a fore leg over the coupling, when grazing, thus preventing injury to the animals.

A drip can has been patented by Mr. Hedwig L. Kinports, of Annville, Pa. It has a concave cover with a central aperture and a pivoted self-opening lid, being specially adapted to catch the drippings of the spigots of barrels containing liquids, such as molasses, etc.

A fastener for meeting rails of sashes has been patented by Mr. John E. Brown, of Honolulu, Hawaii. It is designed to automatically lock the sashes when the windows are closed, in such way that they cannot be unlocked from without by a knife, wire, or similar instrument.

A line protector has been patented by Mr. Frank C. York, of Salina, Kansas. This invention covers an improvement on a former patented invention of the same inventor, in such supports where the straps extend between the forward ends of the thills, with a view to prevent the harness lines from being caught under the ends of the thills.

A windlass has been patented by Mr. Earle C. Bacon, of Brooklyn, N. Y. It is designed to carry several hoisting drums or winch heads actuated from one main shaft, and traveling independently of each other at a differential rate of speed, the invention covering various novel details in construction and arrangement of parts.

A garment stretcher has been patented by Mr. Fred E. Bailey, of Manchester, N. H. Combined with a pair of clamps is a sectional extension brace, readily permitting a varied adjustment of the two sections with respect to each other, with other features, making a convenient stretcher for trousers and other garments.

A trap has been patented by Emily A. Stears, of Brooklyn, N. Y. It is designed for application to wash bowls, bath tubs, wash tubs, and sinks, to permit the free escape of the water while effectually preventing the entrance of sewer gas through the wash bowl and sink connections, while the construction of the trap is such that it can be readily cleaned.

A mail bag catcher has been patented by Mr. Jarrett M. Keith, of Greenville, S. C. The invention is designed to facilitate the adjustment or reversal of the hook, according to the direction in which the train may be moving, the hook being rendered movable bodily from side to side of the door opening, with other novel features.

A saw swage has been patented by Mr. James H. Miner, of Baton Rouge, La. Combined with the body portion is a steadying pin having a forked end, a screw threaded shank fitting in a screw-threaded socket of the body portion, providing means for swaging teeth of varied thickness, and operating upon the teeth at any point in their width.

A grape seed extractor has been patented by Sarah E. Toucey, of New York City. It has a flat pick with a sharpened point on its end in line with the handle and a groove in its top face, a cutting blade projecting laterally from the pick, and its point forking out therefrom a short distance within the point of the pick.

A composition for softening and renovating leather has been patented by Mr. Leopold C. Dewillers, of Brooklyn, N. Y. It is for preserving and softening all varieties of leather, especially black kids, and consists of soft water, salts of sorrel, castile soap free from potash, oil and ammonia, combined and applied in a manner described.

An elliptic spring has been patented by Mr. James R. Fletcher, of Clarksville, Iowa. It is for use in vehicles, and consists of inner and outer leaves, with means for connecting the ends of the inner leaves, and for spacing the leaves, whereby friction between the parts is reduced and liability to breakage is lessened.

A heater for cars and buildings has been patented by Mr. Thomas McCrossan, of Winnipeg, Manitoba, Canada. The fire box is of cast iron, inclosed by a shell of steel or wrought iron, making an air space, and the draught is supplied through a hollow door, the slides for controlling the draught serving also as a means for fastening the door.

An electric alarm for ships' compasses has been patented by Mr. Augustus Gross, of Newcastle, New South Wales. A bell or bells is so placed in electrical connection that upon any deviation of the vessel from its established course an alarm is sounded to give notice of such deviation, the invention covering a novel construction, combination, and arrangement of parts.

A running gear for vehicles has been patented by Mr. Elijah Hickman, of Red Bluff, Cal. It provides a means whereby the bed of the vehicle may readily move sideways without causing the weight to depress one side more than the other, while the bolster of the hind axle will have a yielding or vibrating action if the wheels come in contact with an obstacle.

A saw guide has been patented by Mr. John O. Morrow, of Thomas Mills, Tenn. The guiding arms are so arranged that they may be reversed to be used on right or left hand mills, while the outer arm may be turned to a position to permit of the removal of the saw from its arbor, a proper adjustment of the several parts of the guide being provided for.

A churn has been patented by Mr. William Bechtold, of New York City. A cream receptacle something like an ordinary glass jar is preferred, which is secured upon a carrier of peculiar construction, when a crank is rapidly manipulated, which reciprocates the carrier, and imparts a quick, churn-like motion to the cream, bringing butter in a few minutes.

A two wheeled vehicle has been patented by Mr. William Lawless, of Ottawa, Ill. The shaft bars carry a cross beam on which is held a spring supporting the outer ends of the seat bars, which are pivoted at their inner ends on the shaft bars, whereby the seat can be conveniently adjusted to suit the driver.

A dough kneading machine has been patented by Mr. Bryant H. Melendy, of Battle Creek, Mich. It has a roller journaled in a frame open at top and bottom, a partition held in the frame in front of the roller, and a plate adjustably secured to the partition and having its lower end projecting below it, for kneading dough for all kinds of bread, crackers, pastry, etc.

A feathering paddle wheel has been patented by Mr. Amos H. Carpenter, of West Waterford, Vt. This invention relates to feathering blade wheels in which transverse rock shafts on the main shaft each carry counter blades thrown alternately into and out of action by cams operating the blades in their rotation, to render wheels of this character peculiarly adaptable as propellers.

A slatted blind has been patented by Mr. John A. Sherington, of New York City. The frame has a recessed moulding in which is a fixed plate having a series of apertures, collars adapted to turn the slats having their bearings in the slots of the fixed plate, angle arms entering the recesses of the moulding and a rod being pivotally connected thereto, for conveniently opening and closing the blinds.

A filter has been patented by Mr. Marshall McDonald, of Washington, D. C. The invention proceeds on the plan of filtering only a portion of the water that enters its case, the rest of the water being used in connection with a body of sand for scouring or cleansing the filtering surface, the filter thus automatically cleaning itself, and eliminating from a portion of the water all sedimentary matter.

A detachable shelf and heat regulator for ovens has been patented by Mr. Oscar F. Frost, of Monmouth, Me. It consists of a horizontal rectangular frame to rest on the slide supports of a baking oven, in connection with counterbalanced shutters pivoted within the frame and a sliding bar placed edgewise under the shutters, with other novel features, whereby the heat may be regulated at will in the oven.

A wire cloth holder has been patented by Mr. William A. Tea, of Clyde, Ohio. A roller is journaled in brackets projecting from a supporting frame, there being a pivoted and spring pressed bar above the roller, outwardly projecting arms secured thereto, and a roller removably held in the outer ends of the arms, whereby rolls of wire cloth may be compactly arranged and any number of yards easily measured off.

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TABLE OF CONTENTS.

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3. Page of engravings giving a general view of the successful operations of moving the great Brighton Beach Hotel at Coney Island.
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18. Illustration showing the beautiful dwelling and grounds of Timothy Merrick, Esq., Elmwood, Holyoke, Mass.
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20. Miscellaneous contents: Relative strength of stones and bricks.—Echoes and reverberations in rooms.—Dimensions of the most important of the great cathedrals.—Boston not water distribution.—Roofs for mills.—Combined rain water cut-off and filter, illustrated.—The genesis of a tornado.—A millstone recipe.—Lumber trade notes.—Warming and ventilating.—Grant memorial com petition.—The Arkansas dry kiln.—Paint for fresh cement.—Foreign made joinery.—Floor paints.—Large dams.—Preservation of timber.—How to ornament a vase.—Enemies to varnish.—Filling for floors.—Wooden water pipes.—Ready mixed paints.—The Ridgway refrigerator system, illustrated.—A sanitary heating apparatus, illustrated.—The Prentice patent metallic hip shingle.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1) E. F. S. asks: 1. How much iron wire does it take for armature for simple electric motor described in SCIENTIFIC AMERICAN, No. 11, March 17? A. About 2 pounds. 2. How far apart should the zinc and carbon be in batteries? A. One-quarter of an inch. 3. What is the distance between the parallel parts of the field magnet? A. One and three-eighths of an inch. See SUPPLEMENT, No. 641.

(2) B. L. asks: Will you please to tell me what will prevent, counteract, or destroy electricity in wool during the process of drawing and spinning into yarn, and also what will counteract the attraction between the roller and wool in the same process? The rollers are of wood and covered with leather. A. If practicable, keep the room damp, either by sprinkling the floor or hanging up wet cloths around the machine. If you cannot do this, you will probably be obliged to substitute metallic rollers for your leather covered ones.

(3) W. H. T. writes: 1. I wish to make a small electric motor, half the size of the one described in the SCIENTIFIC AMERICAN of March 17, 1888. Please inform me through your valuable paper, the SCIENTIFIC AMERICAN, how I should proceed. Should I have 6 or 12 coils in the armature? A. 12. 2. How many layers and convolutions should I have in each coil of the armature? A. Same as given in the article referred to, that is, 4 layers and 8 convolutions in each layer. 3. How many layers in the field? A. 5. 4. The size of wire to be used, 16 or 32? A. Use No. 20 on the field magnet and No. 24 on the armature.

(4) F. Van D. asks: 1. Would it affect the power of the motor to use common sheet iron instead of the Russia iron? A. No. 2. How many cells of 1 pint each of simple plunge battery, described in the issue of August 20, 1887, page 116, would it take to give power enough to run a sewing machine? A. The simple plunge battery is too small for use in connection with the motor. You could, however, run a sewing machine by the employment of a large number of such batteries, but it is advisable to use a larger battery.

(5) A. L. S. asks: 1. Would the hand power dynamo described in No. 161 be powerful enough to run one or more 16 candle power incandescent lights? A. It will not run a 16 candle power lamp. It will run a 6 or 8 candle power lamp of low resistance. 2. Would the motor described in 641 be sufficient to run the dynamo? A. No. If it were large enough to run it, the current generated by the dynamo would be less than that required to run the motor.

(6) F. A. T. writes: 1. In regard to batteries of small electric motor, described in your issue of March 17, 1888, would a number of carbons, 2 x 6, such as are used in the Leclanche battery, do, if say four were connected for each cell? A. Yes. 2. Does the zinc have to be pure? I have the motor almost finished, but cannot procure the carbons, 6 x 8, or zinc, here. A. It should be pure to secure the best results, but impure zinc will answer if well amalgamated.

(7) H. Y. Z. writes: In the SCIENTIFIC AMERICAN SUPPLEMENT, No. 641, you describe an electric motor. I wish to reduce the linear measures one-half; in doing so would it be advisable to reduce the number of coils on the armature to 6, also what size of insulated copper wire to use? A. The number of coils on the armature should remain the same. Use No. 18 wire on the field magnet and No. 20 on the armature.

(8) W. E. asks: If the dimensions of the simple electric motor be doubled, with what size wire should the armature and magnet be wound to give proportionate results? A. Use wire of the same size all around, and connect the conductor of the halves of the field magnet in parallel.

(9) L. M. W. asks: Can the "Simple Electric Motor" described in the SCIENTIFIC AMERICAN of March 17, 1888, be driven as effectually by a Bunsen's constant battery as with the plunge battery mentioned in the article? If so, how many elements will it need, and should the elements be coupled so as to make a quantity or intensity battery? A. The motor can be driven by a Bunsen battery by connecting the cells up in parallel so as to produce a quantity current. The best arrangement can readily be determined by experiment.

(10) A. W. N. asks (1) how to connect the motor described March 17, so as to make it a dynamo. A. The connections are the same for the dynamo as for the motor, but you should make the field magnet of cast iron, and wind the armature with fine wire, say No. 20. 2. What would be the power of it as a dynamo? A. No experiments have been made to determine this. 3. How can I make it so that I can run it either way at will? A. By providing two sets of brushes oppositely arranged with respect to each other, and mounted so that you can bring either set into contact with the commutator. 4. Will common stove pipe iron do for the magnet? A. Yes.

(11) W. C. P. asks: 1. Can the simple electric motor be used as a dynamo? If so, how will its power compare with the dynamo described in SUPPLEMENT, No. 161? A. Yes; see recent back numbers of SCIENTIFIC AMERICAN. 2. You say that the battery used to drive the motor will become exhausted in three or four hours. Do you mean that it will be necessary at the end of that time to put in new zincs as well as new solution? A. It is the solution that becomes soon exhausted. The zincs will last for some time.

(12) E. M. C. writes: In small induction coils, such as used in pocket batteries, what is the size and how much wire is used to produce the best effects, for both primary and secondary coils? A. Make the core of the induction coil of a bundle of fine soft iron wires. Its diameter should be three-eighths of an inch, its length 3 inches. Insert it in a thin spool of paper or wood, and wind upon the spool 2 layers of No. 20 insulated wire. Cover this primary coil with one thickness of writing paper, then wind on 10 layers of No. 36 silk covered wire. You can modify the current by slipping a brass tube over the exterior of the coil.

(13) A. L. F. asks: 1. What would be dimensions of steel bar magnet and helix of sufficient power to operate an electro magnetic bell in place of galvanometer as shown in Fig. 2, page 233 current number? A. An ordinary relay magnet and a 6 inch horseshoe machine magnet will do it. 2. Why are permanent magnets generally made of flat steel? A. Simply for convenience. 3. About what proportion of power could be transferred from a permanent magnet by means of a helix, to an electro magnet connected in same circuit? A. Only a small amount of power can be transmitted in this way.

(14) J. C. — The botanical specimen which you send to be named is a lichen, sometimes popularly called "tree moss," or "tree hair." Scientifically it is known as *Usnea barbata*. It is very widely distributed, growing from Mexico to Canada, and far northward. It has no commercial or other value.

(15) W. M.—For latest form of lime kilns, see SUPPLEMENT, No. 572.

(16) C. E. K. asks: I am building an electric telephone on which I have to use an induction coil. Can I not use a smaller and a more simple one than described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 569? A. Make a core 3 inches long and 3/8 inch in diameter of No. 20 annealed iron wire. Wrap the core with two thicknesses of writing paper, wind on the core four layers of No. 20 magnet wire for the primary coil, cover the primary coil with one thickness of writing paper, then wind on ten layers of No. 38 silk-covered copper wire for the secondary.

(17) G. L. writes: I have made a single cell Grenet battery, but it does not keep its power more than two weeks, therefore, I would like to make a single cell battery that will last longer and have more power. A. We know of no battery giving a strong current that will remain in good condition for more than two weeks. The Grenet battery is more readily renewed than any other capable of yielding the same current.

(18) W. R. asks: 1. In making the electric motor described in SUPPLEMENT, No. 461, only half size, for instance the field magnet only 5 inches instead of 10 inches, and so on, what size of wire should I use for armature and field magnet? A. Use No. 20 wire. 2. How many coils do I want of such? A. Use 12 coils on the armature.

(19) T. F. W. writes: I am mining a little, and have some copper plates that have been silver plated, and now the plating is partially wore off. The question is, is there any kind of solution that will answer for dressing the old plates, so that the verdigris will not show on plates? A. The plates you refer to are probably the amalgamated plates used for collecting small particles of metal. Such plates are usually coated with quicksilver. You can recoat them by washing them over with a mixture of dilute nitric and sulphuric acid, afterward sprinkling on a little mercury and rubbing it around.

(20) C. E. H. asks: How will I have to wind the armature and field magnet so that it will run from the power given to a 16 candle power incandescent lamp by a Westinghouse incandescent machine? I have tried to run it with this power. The first time I tried it, it gave about 1/2 horse power, in fact it was as much as I could do to keep it steady, but since then it will not go at all. What is the reason? If it cannot be made to run by this power, how can I make a storage battery that will run it? The current to store to be obtained from the Westinghouse incandescent light. A. It is probable that the insulation of your armature is burned so that the machine is short-circuited. You should use a lighter current. You can arrange this by placing your machine in a shunt. For information on making storage batteries consult SCIENTIFIC AMERICAN SUPPLEMENTS. See catalogue, which we send you.

(21) A. M. asks: 1. Can the sleeve, A, of the commutator of the 8 light dynamo described in SCIENTIFIC AMERICAN of April 30, 1887, page 278, be made of either iron or brass? A. Yes. 2. Can the collar, D, be made of wood or leather? A. The collar might be made of hard wood, but we fear it would not be durable; leather would not answer, as it would readily burn. 3. Can the commutator cylinder, E, be made of brass? A. Yes, but brass would last but a very short time. 4. Can the brackets (which are fastened to the field magnets, and receive the armature shaft) be made of brass? A. Yes, but it is neither so rigid nor so durable as bronze. 5. What properties must a current possess to produce an arc and incandescent light? A. The current to produce an arc light should have an electromotive force of at least 50 volts. Incandescent lights can be adapted to currents of either high or low voltage. 6. Does it require a greater current strength to raise a platinum wire to incandescence in open air than it would were it in a vacuum? A. No. 7. Do you know of a good cement for cementing glass and vulcanite? A. Equal parts of gutta percha and pitch melted together.

(23) A. M. M. writes: Having read your recent articles "How to Make a Simple Electric Motor" with a great deal of interest, I would like to have answered through your column devoted to such Notes and Queries the following questions: 1. What will it cost per hour to run 8 cells 5 inches by 7 inches plunging bichromate battery? A. We have at present no data which will enable us to answer this question. It would, however, probably cost from 10 to 15 cents per hour. 2. Is such a battery of sufficient power to run a small canoe? A. Yes. 3. What size propeller would be best? A. About 6 inches.

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

April 24, 1888,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Alarm. See Fire and burglar alarm.
Alloy, metallic, Ostermann & Prip 381,718
Alloy, metallic, Ostermann & Lacroix 381,719
Ammonia and boneblack, obtaining, F. Egner 381,832
Annunciator and signaling apparatus, M. Martin. 381,709
Annunciator, electric, J. Geary 381,772
Armature, dynamo, J. F. Kelly 381,700
Armature, dynamo, M. A. Muller 381,636
Axle lubricator, car, G. F. Godley 361,691
Axle, vehicle, J. F. Dixon 381,829
Axles, dust guard for car, W. S. Soule 381,591
Bag handle, sheet metal, R. C. Jenkinson 381,790
Band, elastic, R. W. Howard 381,879
Bell and alarm, combined door, C. M. Dilley 351,539
Bell, electric, C. F. De Redon 381,765
Bell or mechanical striker, electric, J. H. Brickford 381,823
Belt fastener, W. L. Potter 381,640
Blast furnaces, dust catcher for, F. W. Gordon 381,774
Blind, slatted, J. A. Sherington 381,649
Block. See Meat block.
Boat, G. N. Tibbles 381,729
Boiler. See Steam boiler.
Boiler, A. Worthington 381,870
Boiler and furnace, A. Sterling 381,595
Bolt. See Elevating bolt.
Book cover, O. W. K. J. Nordenfalk 381,846
Boor or shoe, Pratt & Johns 381,579
Bottle washing machine, H. Palmer 381,638
Box. See Bread, cake, or cheese box.
Box, W. H. Scott 381,889
Boxes, wire fastener for, J. Esselbach 381,684
Bracket. See Harness bracket.
Brake. See Car brake. Wagon brake.
Brakes, slack adjuster for, O. C. Crane 381,928
Bread, cake, or cheese box, S. E. Bowersock 381,824
Bread making machine, A. A. Humble 381,554
Bridge, R. A. Sawyier 381,584
Brush, J. J. Ashburner 381,749
Brush, blacking, Beauregard & Bidwell 381,607
Buildings, construction of, M. H. Eaton 381,767
Bureau, D. C. Clapp 381,760
Burner. See Vapor burner.
Caisson, portable, H. P. Kirkham 381,797
Can for printer's ink, etc., C. H. Hollis 381,553
Car brake, F. W. Mills 381,570
Car brake, M. B. Mills 381,571
Car coupling, W. B. Seal 381,648
Car starter, J. Zeliff 381,602
Cars by electro-chemical means, heating railway, E. E. Ries 381,819
Cars, electric heating apparatus for railway, E. E. Ries 381,816
Cars, heating railway, E. B. Benham 381,754
Cars, heating railway, W. M. Scott 381,647
Carding engine, J. M. Hetherington 381,781
Carriage, baby, J. H. Gibson 381,834
Carriages, cribs, or cradles, attachment for baby, S. A. Holman 381,878
Cash register, H. A. Alm 381,520
Cash register, W. F. Lamb 381,561
Caster, trunk or furniture, J. P. Carmichael 381,759
Casting curved pipe, core arbor for, P. Rieth 381,645
Casting metal, D. C. Stover 381,655
Chain fastener, Sears & Kelley 381,855
Chairs, automatic fan attachment for rocking, M. Marcoux 381,897
Chart, adjustable pattern, S. Mandelbaum 381,563
Chock or leader, anti-frictional, L. Dyer 381,831
Chuck, drill, J. N. Skinner 381,857
Churn, W. Bechtold 381,668
Cigar machine, F. E. Pellant 381,812
Clevis, adjustable, J. Peters 381,578
Clock, A. & H. E. Junghans 381,626
Clocks, winding and setting attachment for, J. Zelly 381,603
Closet. See Water closet.
Cloth cutting machine, G. A. Ries 381,644
Coaster, wheeled, O. A. Wheeler 381,661
Coat and pantaloons supporter, combined, S. L. Rice 381,888
Comb. See Curry comb.
Compasses, electric alarm for ships', A. Gross 381,693
Compressing or blowing engine, W. E. Good 381,876
Conduit, J. Steel 381,653
Cooker and frier, combined steam, H. C. Hornish 381,784
Corn husking machine, H. H. Armstead 381,748
Cotton gin, C. T. Mason, Jr. 381,564, 381,565
Coupling. See Car coupling. Hose and faucet coupling. Tube coupling.
Cuff holder, J. H. Reed 381,642
Cultivator fender, J. W. Kennedy 381,701
Curry comb, U. B. Hird 381,550
Curry comb, F. S. Neal 381,637
Cushion. See Plumber's air cushion.
Cutter head, W. H. Lamson 381,799
Dental engine, Hood & Reynolds 381,783
Dental plugger, P. C. Morse 381,844
Depilating and bating, J. Townsend 381,780
Desk and type writer cabinet, combined, W. H. Porter (r) 10,924
Digger. See Potato digger.
Ditching machine, H. G. Lane 381,704
Divider, multiple, J. Krumscheld 381,560
Door opener, electric, J. Schneider 381,725
Draw bars, die for making, J. T. Wilson 381,894
Draw bars, making, J. T. Wilson 381,895
Drill. See Rock drill.
Dust collector, G. Behrns 381,753
Dust collector, H. N. Pomeroy 381,639
Ear muff, Kleinert & Manville 381,559
Egg rack, Beatty & Hoffner 381,523
Electric energy, transformation and distribution of, R. Kennedy 381,794
Electric indicator, E. Weston 381,736
Electric light carbon, T. L. Clingman 381,614
Electric machine and motor, dynamo, M. Immisch 381,789
Electric machine, steam dynamo, R. H. Mather ... 381,568
Electric motors, regulation of, S. D. Field 381,768
Electrical apparatus, C. C. Sibley 381,856
Elevating bolt, F. Prinz 381,848
Elliptic spring, J. R. Fletcher 381,688
Engine. See Carding engine. Compressing or blowing engine. Dental engine.
Envelope holder. Culver & Smith 381,677
Extractor. See Seed extractor. Stump extractor.
Feed water heater. T. Fairbanks 381,618
Fence, J. Z. Stanley 381,858
Fence making machine, upright wire and picket, Hill & Rider 381,548
Fence post, J. W. Davy 381,873
Fender. See Cultivator fender.
Fire alarm system, automatic, J. Young 381,896
Fire and burglar alarm, electric, A. Schuchman ... 381,852
Firearm, magazine, Aughenbaugh & Ruffley 381,821
Fire escape, portable, W. Brown 381,672
Fire extinguisher, chemical, T. G. Turner 381,658
Fire hydrant, pneumatic, H. L. McAvoy 381,805
Furnace. See Hot air furnace. Ore roasting furnace.
Furnace for heating soldering coppers, E. Holm .. 381,782
Fuse, shell, T. Nordenfelt 381,717
Gauge. See Saw table gauge.
Gas and air fuel mixing chambers, sectional hood for, C. H. Miller 381,632
Gas mains, sliding joint for, D. M. Marquis 381,803
Gate, J. N. Hatcher 381,694
Gate, H. E. Moore 382,634
Gate, H. A. Spencer 381,592
Gate, J. Z. Stanley 381,859
Glass blowing apparatus, W. M. Piper 381,887
Glove, baseball, F. G. Fischer 381,687
Gloves, etc., fastener for, E. J. Kraetzer 381,703
Governor, J. W. Thompson 381,597
Grain garners, automatic latch for, P. E. Canfield 381,528
Grate, J. O'Keefe 381,886
Guns, apparatus for conveying ammunition to, C. H. Murray 381,715
Guns, vertical breech closing mechanism for, W. Lorenz 381,628
Guttering to the eaves of houses, hanging sheet metal, C. C. Frederick 381,770
Hammock, A. Dickey 381,538
Hammock or swing, M. Broderick 381,827
Hammock spreader, V. P. Travers 381,863
Hammock [supporting ropes, holder for, V. P. Travers 381,864
Handle. See Bag handle. Saw handle.
Handle, T. L. Rivers 381,646
Harness bracket, J. Harbison 381,776
Harrow, G. W. Gorsuch 381,835
Harrow, J. Hildesheim 381,623
Harvester, J. R. Beard 381,606
Hat for firemen, T. Anderson 381,666
Hat wire, A. Cary 381,530
Hay loader, E. L. Hay 381,779
Hay loader, N. S. Johnson 381,699
Hay rakes, cleaner arm for the teeth of horse, N. Stafford 381,593
Hay rakes, horse, G. Keith 381,840
Header and thrasher, combined, Reynolds & Patterson 381,723
Heater. See Feed water heater.
Heater for cars and buildings, T. McCrossan 381,806
Heater for muffs, etc., F. Hiller Jr 381,549
Heating by compressed gas or superheated air T. J. Simpson 381,589
Heating by electricity, E. E. Ries 381,815
Heating, electro-chemical, E. E. Ries 381,818
Electric system, electric, E. E. Ries 381,817
Heel plate attaching machine, W. J. Atwell, 381,604, 381,605
Holder. See Cuff holder. Envelope holder. Pencil holder. Rein holder. Sash holder.
Hook. See Snap hook.
Horse detacher, J. McMorries 381,712
Horse power, R. G. McElroy 381,807
Horses, device for assisting in training, H. C. Woodnutt 381,745
Horses, devices for checking, Quinn & McLellan. 381,580
Horses, device for stopping, A. Wedekind 381,735
Horses, split hoof clamp for, J. H. Wiestner 381,868
Hose and faucet coupling, T. Mackel 381,562
Hose carriage, garden, J. J. Divekey 381,540
Hot air furnace, C. N. Bacon 381,750
Hot air furnace, J. B. Oldershaw 381,574
Hub, vehicle, M. E. True 381,891
Indicator. See Electric indicator.
Ingots, making compound, L. L. Burdon 381,527
Interlocking switch and signal, G. Gibbs 381,773
Iron. See Sad iron. Soldering iron.
Joint. See Pipe joint.
Kneading machine, dough, B. H. Melendy 381,631
Ladder, G. H. Thompson 381,656
Ladder, fire escape, and hose carriage, combined extension, C. B. Schumann 381,587
Ladder, flexible, C. B. Schumann 381,853
Lantern, Drew & Grant 381,836
Lantern, H. L. Jewell 381,557
Lantern, tubular, L. F. Betts 381,755
Last, J. B. Mullen 381,845
Lasts, making shoemakers', F. G. Hitzfeld 381,551
Latch and handle, lever, J. F. Wollensak 381,740
Latch, double-acting, A. H. Jones 381,792
Leather, composition for softening and renovating, L. C. De Willers 381,680
Letter sheet and envelope, combined, W. H. Kister 381,558
Lifter. See Transom lifter.
Liquid reservoirs, float and level indicator for, W. E. Eastman 381,541
Lithographic presses, inking apparatus for, F. Macdonald 381,708
Lock. See Nut lock. Safe lock. Seal lock.
Locomotives, apparatus for applying sand to the driving wheels of, J. Gresham 381,837
Loom let-off mechanism, G. F. Hutchins 381,787
Looms, whip roll for, D. Durkin 381,617
Looms, whip roll for, A. F. Parker 381,720
Lubricator. See Axle lubricator.
Lubricator, R. Marshall 381,804
Lubricator, M. Schneider 381,586
Mail bag catcher, J. M. Keith 381,841
Mattress, tubular floating, Pigeon & Lacroix 381,813
Measurement apparatus, electrical, H. V. Hayes .. 381,780

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Measuring apparatus, fabric, J. W. Kruger..... 381,642
Meat block, sectional, B. A. Stevens..... 381,654
Mill. See Roller mill. Sawmill.
Milling machine, A. H. Brainard..... 381,525
Millstone dress, J. Bachulein..... 381,522
Mirror, J. B. Vienney..... 381,600
Muzzle, R. B. Cole..... 381,615
Nail plate feeder, A. H. Tyrrell..... 381,599
Nut lock, E. H. A. Oakley..... 381,573
Nut making machine, F. Bruser..... 381,872
Oiling shells, projector for sea, A. H. Walker, 381,732, 381,733
Ordnance, breech-loading, B. B. Hotchkiss..... 381,697
Ore roasting furnace, J. L. Lovell..... 381,629
Ores and materials containing sulphur for the extraction of metals and other constituents, treatment of, R. & C. Oxland..... 381,809
Ores and metallurgical products, treating, E. H. Russell..... 381,849, 381,850
Paddlewheel, feathering, A. H. Carpenter..... 381,674
Pantry, portable, H. M. Ramey..... 381,641
Paper clip, J. W. King..... 381,702
Paper machines, renewing strainer plates for, F. Williams..... 381,737
Pavement, concrete, G. A. Bayard..... 381,667
Pencil holder, O. Bussler..... 381,612
Pencil holder, lead, O. Bussler..... 381,611
Pencil, propeller, J. Hoffman..... 381,877
Pencil rack and eyeglass hook, combined, J. Graham..... 381,692
Pencils, machine for the manufacture of crayon, J. W. Peck..... 381,810
Phosphorus trichloride, apparatus for obtaining, C. Fahlberg..... 381,685
Piles, protecting, G. Brown..... 381,671
Pin. See Safety pin. Thill coupling pin.
Pinchers, grubbing, J. M. Ricketson..... 381,581
Pipe. See Stove pipe.
Pipe joint, spherical, H. W. Brinckerhoff..... 381,826
Pipes, expansible joint for, H. W. Brinckerhoff... 381,825
Planer attachment for cutting internal gear, G. F. Hutchins..... 381,788
Planter, corn, F. P. Murphey..... 381,883
Planter, corn, J. Selby..... 381,588
Plow, D. H. Carpenter..... 381,529
Plumber's air cushion, A. H. Walker..... 381,731
Post. See Fence post.
Potato digger, J. Lee..... 381,706
Power. See Horse power.
Printing presses, sheet straightener for, Loewenbach & Matter..... 381,800
Propelling canal boats, system and apparatus for, C. F. Cassleman..... 381,675
Propelling device, W. Johnston..... 381,625
Pump, W. W. Cully..... 381,532
Pump, E. Neff..... 381,808
Pump, double-acting force, J. M. Normand..... 381,885
Punching cards, machine for, S. J. Murray..... 381,716
Punching machine, bag, F. Hirsch..... 381,696
Quilting machine, W. Koch..... 381,798
Rack. See Egg rack. Pencil rack.
Railway chairs, die for making, E. B. Entwisle.... 381,875
Railway conduits, trap for electric, W. M. Schlesinger..... 381,585
Railway, electric, R. M. Hunter..... 381,555, 381,556
Railway, suspended cable and electric, Taylor & Heckert..... 381,862
Railway trains, combined station indicator and signaling apparatus for, J. H. Bickford..... 381,669
Railways, automatic switch and frog for, Cromer & Gavin..... 381,676
Railways, combined metal tie and fastening for, E. R. Stiles..... 381,860
Railways, device for removing obstructions or preventing accidents on street, C. Mahon..... 381,881
Railways, electric motor for, S. H. Short..... 381,650
Railways, motor for street, B. C. Pole..... 381,847
Rake. See Hay rake.
Rake and fork, combined, L. R. Stagner..... 381,594
Reel. See Skein reel.
Register. See Cash register.
Rein holder, W. E. Beisonhert..... 381,608
Rock drill, S. Ingersoll..... 381,838
Roller mill, J. D. Mawhood..... 381,710
Rolling mill plant, Garrett & Wellman..... 381,689
Rolling sheet metal, F. H. Wright..... 381,746
Roofing, cap and anchor for metallic, B. F. Caldwell..... 381,756
Roofing, machine for painting metallic, Caldwell & Peterson..... 381,757
Rudder, W. W. Huntley..... 381,786
Running gear, E. Hickman..... 381,695
Sad iron, W. H. Mull..... 381,572
Safe lock, J. White..... 381,894
Safe, provision, H. Randol..... 381,721
Safety pin, D. A. Carpenter..... 381,613
Sample fastener, C. Folsom..... 381,769
Sash cord fastener, G. L. Thompson..... 381,728
Saw, J. J. Ralya..... 381,814
Saw, drag, R. Doak..... 381,890
Saw filing machine, H. L. Bump..... 381,610
Saw guide, J. O. Morrow..... 381,635
Saw handle, crosscut, H. L. Kincaid..... 381,796
Saw holder, circular, J. Slater..... 381,651
Sawmill, band, Smith & Kelly..... 381,726
Saw, scroll, H. L. Beach..... 381,751
Saw sharpening machine, W. H. Halladay..... 381,775
Saw swage, J. H. Miner..... 381,633
Saw swaging device, C. A. Schoessel..... 381,851
Saw table gauge, H. L. Beach..... 381,752
Scale, counter, J. B. Butenschon..... 381,673
Scraping machine, road, W. F. Wellman..... 381,867
Seal lock, C. E. Davis..... 381,534
Seed extractor, grape, S. E. Toucey..... 381,657
Seed, method of and apparatus for treating fiber coated, W. F. Corne..... 381,616
Sewers and drains, air inlet for, E. S. McClellan... 381,711
Sewing machine attachment holder, J. M. Griest.. 381,546
Sewing machine feeding device, R. M. Hatcher... 381,778
Sewing machine trimming attachment, J. W. Dewees..... 381,537
Sewing machine welt trimmer, J. W. Dewees..... 381,536
Shade pull, C. W. Elliott..... 381,548
Shade roller support, E. H. Munger..... 381,714
Shoe heel, A. Farina..... 381,686
Sign, advertising, L. A. Deuther..... 381,766
Signaling apparatus, electric, M. W. Parrish..... 381,576
Signaling apparatus, telegraphic, J. B. Willis..... 381,738
Siphon, G. W. Arper..... 381,521
Skein reel, J. Garsed..... 381,771
Skeins, alum tanned, Warter & Koegel..... 381,734
Sled, S. L. Allen..... 381,665
Snap hook, E. A. Wilson..... 381,739
Soldering iron, C. R. Danielson..... 381,533
Soldering irons, apparatus for cleaning, H. H. Cox 381,761
Soldering pliers, O. F. Garvey..... 381,544
Spark arrester, H. W. Libbey..... 381,707
Spinning frames, fulcrum for the weight lever for the rolls of, Driscoll & Boylen..... 381,681
Spinning machine, J. Marjerison..... 381,566, 381,567
Spoke drawer, J. M. Germann..... 381,690
Spring. See Elliptic spring.
Stamp, printing, Lang & Watson..... 381,880
Stand. See Wash stand.
Steam boiler, L. B. Battin..... 381,822
Steam boiler, J. Johnson..... 381,791
Steam engine, Scribner & Heckert..... 381,854
Steam trap, F. G. Botsford..... 381,670
Steel bands, apparatus for tempering, J. Oldham.. 381,575
Stereotype plates which are cast separately from their beds, means for securing, E. D. Rogers.. 381,820
Stilt, L. Hoffman..... 381,552
Stone saw, J. Peckover..... 381,811
Store service apparatus, J. H. Goodfellow..... 381,545
Stove back, Devore & Greene..... 381,535
Stove back, W. C. Metzner..... 381,713
Stove, cooking, W. J. Keep..... 381,793
Stove pipe, U. D. Alexander..... 381,871
Structural articles, composition for surfacing, T. McSweeney..... 381,882
Stump extractor, G. M. Stroup..... 381,861
Supporter. See Coat and pantaloons supporter.
Suspender fastening, H. Fried..... 381,883
Switch. See Interlocking switch.
Syringe, T. M. Healey..... 381,622
Tableware, J. A. Kimball..... 381,795
Tag or label for poultry, I. J. True..... 381,598
Telegraphy, P. B. Delany..... 381,764
Telegraph, dynamo, F. W. Jones..... 381,839
Telephone receiver, W. H. Collins..... 381,531
Thill coupling pin, J. E. & J. B. Vail..... 381,659
Tobacco receptacle, P. Lorillard, Jr..... 381,801
Tool, combination, G. W. Ribble..... 381,724
Trace fastening, Newsom & Oxley..... 381,884
Track, portable connecting, A. V. Du Pont..... 381,874
Transom lifter, J. F. Wollensak..... 381,741 to 381,744
Trap. See Steam trap. Well trap.
Trap, W. R. Blaney..... 381,524
Tricycle, Dearlove & Thresher..... 381,763
Tricycle, M. Slutz..... 381,590
Trousers or overalls, J. Hetherington, Jr..... 381,624
Truck, barrel, E. J. S. Davis..... 381,762
Truck, car, L. Goddu..... 381,620
Truss, H. C. Stickey..... 381,727
Tube coupling, F. A. Williams..... 381,869
Tube expander, C. H. Robinson..... 381,583
Tubes, straightening, L. L. Burdon..... 381,526
Type containing channel, A. A. Low..... 381,802
Type writing machine, C. Spiro..... 381,652
Valve for water gauges, Bray & Nickerson..... 381,609
Vale gear, J. Des Brisay..... 381,678
Valve gear, J. W. Thompson..... 381,596
Valve gear, J. Young..... 381,747
Valve, hydrant, O. B. Wilson..... 381,662
Vapor burner, F. A. Lyman..... 381,843
Vapor or gas, device for regulating the quality of carbureted, E. J. Frost..... 381,619
Vehicle, convertible, W. H. Yates..... 381,663
Vehicle top, T. B. McCurdy..... 381,630
Vehicle, two-wheeled, J. P. Callan..... 381,758
Vehicle, two-wheeled, W. Lawless..... 381,705
Vehicle wheel, C. A. Reade..... 381,722
Velocipede crank, J. Harrison..... 381,547
Vending apparatus, J. B. Underwood..... 381,892
Vise, machine, G. B. Taylor..... 381,890
Voltaic battery solution, C. E. Egan..... 381,542
Wagon bolster standard, Koesling & Mecklenburg..... 381,627
Wagon brake, J. B. Walker..... 381,865
Wash stand, J. D. Hall..... 381,621
Washing machine, L. Reinhardt..... 381,643
Watch, stem winding and setting, J. N. Whipple.. 381,601
Watch wheels, means for beveling, H. Huguenin. 381,785
Water closet, F. A. Wells..... 381,660
Water conductor, J. W. Abrahams..... 381,664
Water or gas, electrical method of automatically controlling the supply of, L. Weil..... 381,866
Well trap, W. W. Peay..... 381,577
Wheel. See Paddle wheel. Vehicle wheel.
Windmill, J. Devereux..... 381,679
Windmills, auxiliary motor for, G. C. Hunter..... 381,698
Window, Edgerton & Metcalf..... 381,683
Wire rod mill guide, H. Roberts..... 381,582
Wire stretcher, McMahon & Mangum..... 381,569
Wood, apparatus for impregnating, P. H. Dudley. 381,682

DESIGNS.

Advertising picture frame, F. H. Durell..... 18,265
Burner, nursery, C. T. Martin..... 18,274
Button fastener, W. G. Slater..... 18,281
Caster, furniture, E. Garet..... 18,266
Coffin plate, O. McCarthy..... 18,273
Clock dial, A. Bannatyne..... 18,264
Clock dial, W. Lawson..... 18,272
Glassware, etc., ornamentation of, T. G. Hawkes, 18,267, 18,268
Match, L. Kittinger..... 18,270
Oil cloth, C. T. & V. E. Meyer..... 18,275 to 18,280
Stove, cooking, W. J. Andrews..... 18,263
Type, E. Lauschke..... 18,271
Type, font of printing, W. W. Jackson..... 18,269

TRADE MARKS.

Aperient water, natural, A. Saxlehner..... 15,396
Boots and shoes, men's, Chase, Merritt & Co..... 15,381
Canned green corn, B. Reiff..... 15,398
Canned vegetables, corn, tomatoes, and fruits, J. H. Preston & Sons..... 15,392
Dress shields, I. B. Kleinert..... 15,386 to 15,388
Flour, Marshall, Kennedy & Co..... 15,390
Incrustation preventive and remover, boiler, Imperial Chemical Co..... 15,385
Lamp chimneys, Minneapolis Glass Company..... 15,391
Lamp chimneys and wicks for certain lamps, C. S. Upton..... 15,398
Newspapers, J. S. Conroy..... 15,382
Pens, except those made of precious metals or in imitation of the same, metallic, D. Leonardt & Co..... 15,359
Plaster bas-reliefs, statuary, statuettes, mouldings, and signs, Bas-Relief Manufacturing Company 15,380
Slate, pulverized, Highland Slate Manufacturing Company..... 15,384
Spades, shovels, and agricultural implements, T. Drysdale & Co..... 15,393
Washing powder, granulated, Riverside Soap Company..... 15,394
Water, apparatus for collecting, filtering, and storing, R. C. Sayer..... 15,396
Whisky, G. & J. G. Smith..... 15,397

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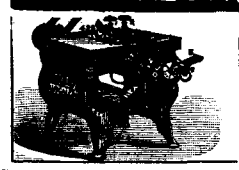

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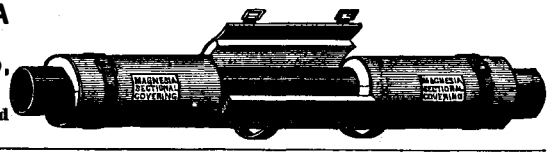

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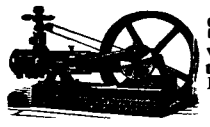

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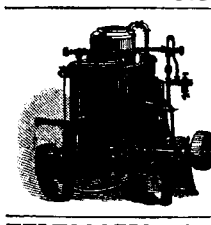

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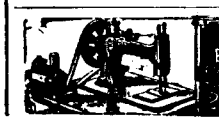

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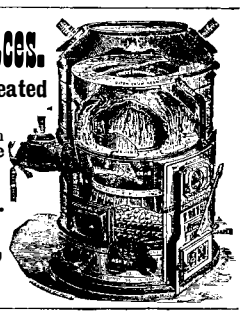

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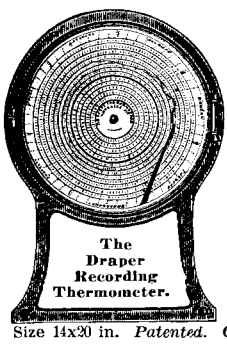

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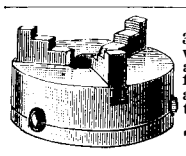

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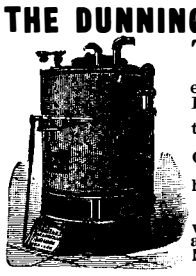

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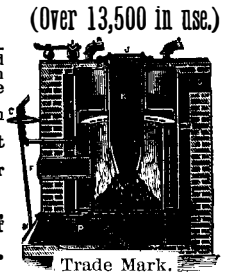

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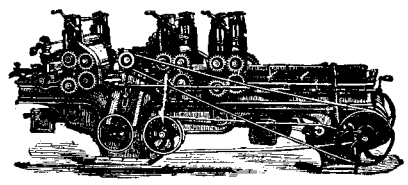

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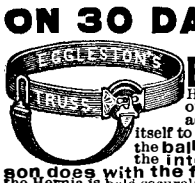

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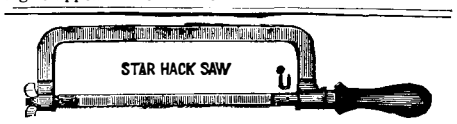

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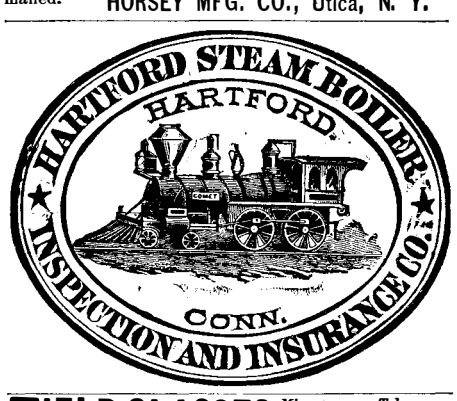

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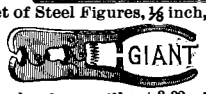

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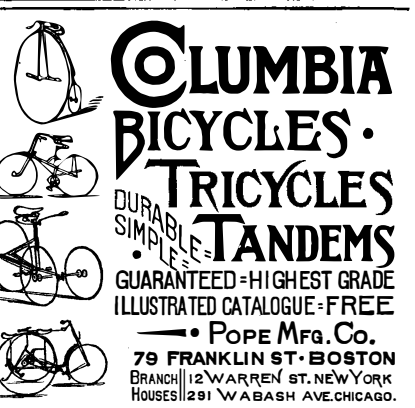

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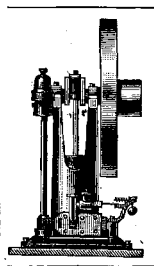

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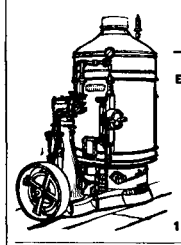

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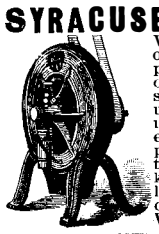

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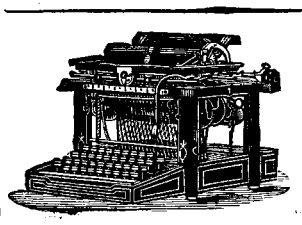

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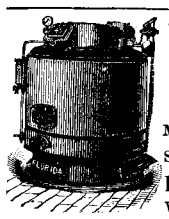

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